

DoD Medical Team Training Programs: An Independent Case Study Analysis

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U.S. Department of Health and Human Services

Mike O. Leavitt, *Secretary*

Office of Public Health and Science

Richard H. Carmona, M.D., M.P.H., F.A.C.S., *Surgeon General of the United States*

Agency for Healthcare Research and Quality

Carolyn M. Clancy, M.D., *Director*

DoD Medical Team Training Programs: An Independent Case Study Analysis

Prepared for:

Agency for Healthcare Research & Quality (AHRQ)
540 Gaither Road
Rockville, MD 20850
www.ahrq.gov

Office of the Assistant Secretary of Defense/Health Affairs
(TRICARE Management Activity)
U.S. Department of Defense
Skyline 5, Suite 810
5111 Leesburg Pike
Falls Church, VA 22041
www.ha.osd.mil

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Prepared by:

American Institutes for Research
David P. Baker, Ph.D.
J. Matthew Beaubien, Ph.D.
Amy K. Holtzman, M.A.

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Abstract

Crew resource management (CRM), a form of team training that was developed for military (and, subsequently, civil) aviation has been adapted for use in health care settings. Several different CRM-derived medical team training programs have been in use within the Department of Defense's health care system and in some civilian hospitals. The Agency for Healthcare Research and Quality awarded a contract to the American Institutes for Research (AIR) to evaluate three DoD-sponsored medical team training programs—MedTeams™, Medical Team Management (MTM), and Dynamic Outcomes Management® (now called LifeWings™). AIR had previously conducted a review for AHRQ of the research literature concerning medical team training.

To conduct this evaluation, the researchers first reviewed student and instructor guides, slides, and other audiovisual materials that the course developers provided to them. Second, the researchers attended and observed the classroom portion of each of the three programs, collected pretraining data on student experiences and expectations and new, independent posttraining data on student reactions to the programs. Finally, trained AIR staff conducted one-on-one interviews with MedTeams and MTM instructors.

The results suggest that all three programs possess several desirable characteristics, such as using active learning techniques and offering training to interdisciplinary health care teams. Nevertheless, each program also had a number of limitations. For example, not one of the programs was based on a comprehensive pretraining needs analysis and participants had limited opportunities to receive structured practice and feedback on critical teamwork skills. Based on their observations from the three case studies, the researchers set out the framework for a successful medical team training program, and recommended further actions to improve and support future medical team training programs.

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Note: Appendixes cited in this report are provided electronically at <http://www.ahrq.gov/qual/teamtrain/index.html#app> .

Executive Summary

Introduction

For fiscal year 2003, the Office of the Assistant Secretary of Defense/Health Affairs tasked the Agency for Healthcare Research and Quality (AHRQ) to independently evaluate the best practices in Crew Resource Management (CRM)-derived training programs for military medical settings. The American Institutes for Research (AIR) was awarded a contract by AHRQ to conduct this research.

This report describes the results of one of the major tasks performed under this effort, an independent case study analysis of Department of Defense (DoD)-sponsored medical team training (MTT) programs. Programs reviewed include MedTeamsTM, Medical Team Management (MTM), and Dynamics Outcomes Management[©] (DOM).^{*} The results described herein provide unbiased information about each MTT program. Prior to this report, program developers had investigated their own MTT program's effectiveness. Therefore this investigation was the first independent assessment. However, although this investigation was an independent assessment, the investigators only had limited access to certain kinds of information. Thus, they refrained from making judgments about the "goodness" or "badness" of each program. Rather the investigators provide comprehensive descriptive information.

Approach

Several sources of information were used when gathering data on MedTeamsTM, MTM, and DOM. First, AIR investigators reviewed student and instructor guides, slides, and other audio-visual materials that course developers provided to them. Document review also included reviewing the relevant research studies that have been published on a specific program's effectiveness. Second, AIR staff attended and observed the classroom portion of each of the courses. Furthermore, AIR collected pretraining data on student experiences and expectations and new, independent posttraining data on student reactions to MedTeamsTM, MTM, and DOM. Finally, for MedTeamsTM and MTM, trained AIR staff conducted one-on-one interviews with instructors who had taught or were going to teach the course.

Results

The results suggested MedTeamsTM, MTM, and DOM possess several desirable characteristics, such as using active learning techniques to develop the participant teamwork-related competencies and offering interdisciplinary training to teams of physicians, nurses, technicians, and other health care professionals. Nevertheless, each program also had a number of limitations. For example, none of the programs were based on a comprehensive pretraining needs analysis; limited opportunities existed for participants to receive structured practice and feedback on critical teamwork skills; and few strategies were available for sustaining and reinforcing teamwork principles in the posttraining environment.

Conclusions

Based on the findings from this investigation and other tasks performed under this contract, AIR defines a successful medical team training program as including the following characteristics:

^{*} Dynamic Outcomes Management has been renamed LifeWingsTM.

- A comprehensive pretraining needs analysis that identifies an organization's readiness for change, possible barriers to training transfer, and common and unique team requirements as a function of medical specialty area.
- A set of validated team knowledge, skill, and attitude competencies that were identified as important during the needs analysis.
- Awareness training that highlights the importance of human factors principles in medicine and develops important team-related knowledge competencies.
- Multiple opportunities for trainees to receive structured practice and feedback on specific team skills through simulation, on-the-job training, or some combination of the two.
- Recurrent training that reinforces team knowledge and skills to prevent skill decay over time.

Recommendations

In addition to defining the key features of a successful medical team training program, the investigators made a number of recommendations to advance both the practice and science of MTT. These recommendations are as follows.

- First, they recommend that the DoD develop a standard list of generic teamwork-related knowledge, skill, and attitude competencies that represent the core elements of successful teamwork in health care.
- Second, the investigators recommend that DoD and AHRQ identify how team knowledge, skill, and attitude competency requirements vary by medical practice, acuity or other job characteristics. Identification of such competencies would lead to practice-specific team requirements and tailored MTT for specific disciplines.
- Third, they recommend that instructional designers look beyond aviation CRM training and leverage all available research and tools (i.e., a tremendous amount of research on teams has been conducted by the U.S. Navy) when developing medical team training programs.
- Fourth, the investigators recommend that the DoD develop a detailed training specification for MTT programs for awareness, practice and feedback, and recurrent training. In addition to describing the core teamwork competencies, the specification would outline the appropriate instructional strategies for each core competency, the appropriate sequencing of training activities, and outcome measures for assessing the degree of skill acquisition.
- Finally, they recommend that AHRQ develop technical assistance documents under the Patient Safety and Quality Improvement Act of 2005 (P.L. 109-41) on issues related to team training and error prevention, much like the FAA's advisory circulars. The investigators believe that human factors-related advisory circulars would go a long way to educate the medical community about the importance of MTT for ensuring patient safety and for ensuring consistency across MTT programs.

Summary

In conclusion, this report presents an in-depth case study analysis of MedTeams[™], Medical Team Management, and Dynamic Outcomes Management[©]. This was the first independent

assessment of these programs. The case study approach allowed for the collection of detailed, comprehensive information on each program, which was reported along a common set of variables.

Chapter 1. Introduction and Methodology^{*}

Background

Patient safety is a top priority in health care. The Institute of Medicine's (IOM) publication, *To Err is Human: Building a Safer Health System*,¹ concluded that medical errors cause up to 98,000 deaths annually. The IOM report brought national focus to this important issue, and has now spawned significant research on the underlying causes of medical errors and the effectiveness of different strategies for improving patient safety. Although still in its infancy, research on strategies to improve patient safety appears to have a bright future.

The Quality Interagency Coordination Task Force (QuIC) was established in 1998 to address a number of critical needs identified in the IOM report. The QuIC is composed of representatives from different Federal agencies including the Departments of Health and Human Services (HHS), Labor (DoL), Defense (DoD), and Veterans Affairs (VA), to name a few. Currently, the QuIC has completed work on existing projects and is awaiting input from members on future initiatives to pursue. The QuIC identified 100 activities for improving patient safety, most of which have been implemented by Federal health care organizations. Among the QuIC's recommendations is the widespread adoption of human factors-based training, such as Crew Resource Management (CRM) training, for improving teamwork in health care.² The QuIC believes that lessons learned from high-risk environments should be looked at when developing new patient safety practices.

Helmreich and Foushee³ concluded that the introduction of CRM has been one of the greatest success stories in aviation. The efficacy of CRM has been established, in part, because CRM has been evaluated throughout its evolution. CRM training was developed interactively—introducing and testing the effectiveness of different strategies, which allowed for the best possible results.⁴ CRM training is the gold standard for what can be produced when those interested in research and those interested in practice work cooperatively to achieve a common goal.

The Federal Aviation Administration (FAA) has issued specific guidance on the development and conduct of CRM training.^{5†} The FAA describes CRM in three phases: an awareness phase, a practice and feedback phase, and a continual reinforcement phase. The first stage of CRM training, awareness training, involves communicating teamwork principles and concepts that are fundamental to a particular task domain and developing attitudes and beliefs that will motivate trainees to be receptive to those ideas.^{4,5} The second stage of CRM training, skills practice and feedback, involves developing the skills necessary to apply the concepts that were introduced in the awareness stage to on-the-job situations. This stage is critical because “individuals may accept, in principle, abstract ideas of [crew resource management concepts] but may find it difficult to translate them into behavior” on-the-job.³ The final stage of CRM training, continual reinforcement, involves repeated exposure to CRM concepts, as well as on-the-job feedback and reinforcement of CRM concepts from multiple sources.

Perceived parallels between health care and aviation have led to a number of CRM-derived medical team training programs. Applications of CRM in medicine started with the introduction of Anesthesia Crisis Resource Management (ACRM) at Stanford University School of Medicine

^{*} Note: Appendixes cited in this report are provided electronically at <http://www.ahrq.gov/qual/teamtrain/index.html#app>.

[†] The current version is Advisory Circular AC 120-51E, dated Jan. 22, 2004.

and the Anesthesiology Service at the Palo Alto (CA) Veteran Affairs Medical Center.⁶ More recently, DoD has funded several medical team training initiatives. MedTeamsTM has been implemented in Army and Navy hospitals,⁷ while Medical Team Management (MTM) has been introduced in the U.S. Air Force.⁸ However, these training programs have not undergone the same scrutiny as CRM. Some evaluation studies have been conducted on ACRM, MedTeamsTM, and MTM, but not with sufficient rigor to draw firm conclusions about each program's effectiveness or the relative effectiveness of different training strategies for promoting teamwork in health care and reducing negative patient outcomes.

The importance of training evaluation is unquestioned by instructional designers and training researchers; however, training is often designed and developed but not evaluated. Training evaluation has been defined as “the systematic collection of descriptive and judgmental information necessary to make effective decisions related to ... various instructional activities.”⁹ These decisions include determining whether the goals and objectives of a program are appropriate to achieve the desired outcome, whether the content and methods in training will result in achievement of the overall program goals, and how to maximize training transfer. Although systematic training evaluation is not an easy task, it is the only way to ensure that training programs have the desired effect and are a worthwhile investment for an organization.

Purpose of this Investigation

The purpose of this investigation is to conduct a case study review of DoD-sponsored medical team training (MTT) programs. The American Institutes of Research (Washington, DC) conducted the investigation under contract to AHRQ during the summer of 2003. Programs reviewed include MedTeamsTM, Medical Team Management (MTM), and Dynamics Outcomes Management[®] (DOM).[‡]

A case study approach was selected for this initial investigation because we did not have the access or the resources to conduct an empirically sound, comparative analysis. For example, convenience samples were relied upon when collecting data from program participants. This resulted in data being collected from MedTeamsTM participants from a DoD facility, future MTM instructors, and DOM participants from a university medical center. Moreover, we only had access to the classroom (awareness phase) portion of each training program. All of the programs address the need for skills practice and feedback through a variety of post-classroom activities, however, due to time constraints associated with this contract, we did not have an opportunity to observe these actions. Therefore, it is important to keep in mind several key characteristics of this investigation when reviewing this report. First, this report describes case studies of three existing medical team training programs: MedTeamsTM, MTM, and DOM. Although data for each case study were described along the same set of dimensions, this information is *not statistically comparable* because it was derived from different information sources with different levels of rigor. Second, the goal of this report was to provide unbiased information to the DoD and AHRQ about these programs as a whole. The program developers have conducted past investigations, and therefore this investigation was the first independent assessment. Finally, because we only had access to certain kinds of information, we refrain from making judgments about the “goodness” or “badness” of each program. Rather, we provide comprehensive descriptive information.

[‡] Dynamic Outcomes Management has been renamed LifeWingsTM.

Prior to describing each program, we first present an overview of training evaluation. Here, we will describe the prevailing approaches for determining training effectiveness, both within and outside of health care. Different approaches exist and we will review the relative merits of each. Second, we present our case study approach for MedTeamsTM, MTM, and DOM. To the extent possible we relied upon best practices from the literature to develop our approach. However, we had to adapt many of these practices to the unique characteristics of the current situation. In this study, we were highly constrained by the extent to which we could gain access to the participants who completed each training program. Our case study approach to investigating these programs emerged from these constraints. Finally, we describe the individuals who participated in MedTeamsTM, MTM, and DOM. For each participant we collected information on several critical pretraining factors that can influence motivation to learn during training.

Training Evaluation

Training evaluation is perhaps one of the most difficult, yet most important, activities in the instructional development process. The purpose of training evaluation is to systematically collect data about a training program to determine the program's overall effectiveness.⁹ Evaluation can be used to determine whether people liked the training program, whether they learned what was intended for them to learn, and whether it positively affected their job performance.¹⁰ It can also be used to gather information about specific aspects of a training strategy such as the usefulness of training materials (e.g., manuals and videotapes), attitudes about new technologies (e.g., automation) and instructional techniques (e.g., lecture versus practice and feedback). When multiple training programs are evaluated on the same dimensions, training programs can be compared to one another, as can different groups of trainees.

A number of approaches have been proposed for conducting detailed training evaluation within different disciplines. Below we review evaluation strategies from the domains of instructional systems design and health care. Then we describe the approach that guided our case studies of MedTeamsTM, MTM, and DOM.

Instructional Systems Design

Kirkpatrick¹¹ proposed one of the first and still most influential models of training evaluation in which he outlined four types (Level I, Level II, Level III, and Level IV) of outcome measures: reactions, learning, behavior, and results.

- Reactions (Level I) are simply measures of how well trainees liked or valued a training program and certain aspects of the program.
- Learning (Level II) involves measuring the extent to which trainees understand and retain principles, facts, and techniques that are imparted during training.
- Behavior (Level III) refers to measures of any behavioral changes that occur as a result of training.
- Results (Level IV) refer to the measurement of the impact of training on organizational criteria; criteria such as increased profitability or enhanced customer satisfaction would be indications of training effectiveness.

A review of the training literature suggests that Kirkpatrick's Level I data, trainee reactions, are the most commonly collected outcome when evaluating training.¹² Reaction measures focus

on a trainee's affective reactions to training,¹³ under the assumption that the extent to which trainees liked the training is correlated with performance on the job. Research that has explored the relationship between trainee reactions and other training outcomes, however, has found that trainee affective reactions correlate only slightly with learning and on-the-job performance (i.e., behavior).^{13,14} Thus, simply asking trainees whether they like a training program does not necessarily predict whether they actually learn anything or alter their behavior on the job. Nonetheless, affective reactions are important. Trainees are the customers of training and negative reactions to training can undermine the credibility of training and the sponsoring organization.

Recent research has indicated that asking trainees about the instrumentality or utility of training is preferred to simply asking them whether or not they liked the training. An example of this type of question might be to ask trainees to indicate the extent to which they perceived training to be of practical value. Such questions seek to determine the usefulness of training for performing a job. Alliger and his colleagues^{13,14} found that, although affective reactions to training (e.g., "Training was enjoyable.") did not relate to subsequent job performance, utility reactions (e.g., "Training was useful.") were related to both learning and performance on the job. Interestingly, these researchers found that measures of learning correlated less with on-the-job performance than either utility reactions or the combination of affective and utility reactions.

In addition to the recent advancements made by Alliger and his colleagues, other researchers have made contributions to the domain of training evaluation by expanding the Kirkpatrick model. Kraiger and his colleagues¹² advocated a multidimensional view of Kirkpatrick's Level II data. These researchers decomposed learning into cognitive, affective, and skill-based outcomes. Similarly, Kraiger and Jung¹⁵ suggested several processes by which learning outcomes can be derived from and linked to instructional objectives of training. Finally, Baldwin and Magjuka¹⁶ pointed out that outcomes are influenced by a number of antecedent conditions that exist and interact within an organization. These include the manner in which training is introduced (voluntary/mandatory, goals, etc.), trainee past experience, pretraining motivation, and the extent to which a positive transfer climate exists within the organization. For example, mandated training will be successful when employees' past experience with similar, mandated programs has been positive, leadership endorses the importance of the training program, and new knowledge and skills are reinforced on the job.

Analytic Models of Health Care

Donabedian's structure-process-outcome model serves as a unifying framework for examining health services and assessing patient outcomes.¹⁷ Donabedian defined *structure* as the physical and organizational properties of the settings in which care is provided, *process* as the actual treatments and procedures that are done for patients, and *outcomes* as what is actually accomplished for patients. From the standpoint of patient safety, Donabedian's model provides a framework for examining how risks and hazards that are embedded within the structure and process of care have the potential to cause injury or harm to patients. For example, individual or team failures on the part of health care providers have been consistently cited as leading to negative patient outcomes.

Coyle and Battles¹⁸ modified the Donabedian model to include important antecedent conditions that can affect patient outcomes. These researchers suggested that accounting for environmental and patient factors is critical in understanding the effectiveness of any new strategy that is introduced or modifications that are made to the patient care process. In health

care, improving patient outcomes is the ultimate criterion for a strategy to be deemed successful. A change in process must lead to a corresponding change in patient outcomes. Under patient factors, Coyle and Battles included genetics, sociodemographics, health habits, beliefs and attitudes, and preferences; under environmental factors they included cultural, social, political, personal, physical, and other factors related to the health professions.

Case Study Approach

For each training program, we were able to access several sources of information. First, we reviewed all available documentation. Document review included reviewing all student and instructor guides, slides, and other audio-visual materials that course developers provided to AIR. Document review also included reviewing the relevant research studies that have been published on a specific program's effectiveness. In addition to our document review, we observed the classroom portion of each of the courses. Furthermore, for each course we observed, we collected pretraining data on student experiences and expectations and new, independent posttraining data on student reactions to MedTeams™, MTM, and DOM. Finally, for MedTeams™ and MTM, we conducted one-on-one interviews with instructors who had taught or were going to teach the course. Each of these activities is briefly described in more detail below.

Document and Literature Review

As part of a larger state-of-the art literature review, AIR reviewed the available research on medical team training and specific medical team training programs. This review identified eight articles, conference papers, or technical reports published on the MedTeams™ approach and one article describing the effectiveness of DOM. Key to our assessment of MedTeams™ was an article published by Morey and colleagues¹⁹ that describes an evaluation of the Emergency Department (ED) curriculum. Key to our assessment of DOM was an article published by Rivers and colleagues²⁰ that describes an evaluation of DOM training. No comparable investigations were found for MTM. Results of these papers are described when we review additional evidence that supports each medical team training curriculum.

In addition to reviewing the literature, we carefully reviewed the instructor and student guides. For MedTeams™, we reviewed the instructor's guide for the Labor & Delivery (L&D) Team Coordination Course and the student's guide for the Operating Room (OR) Team Coordination Course. For DOM, we reviewed the student's guide for a course conducted at a university medical center. Finally, we reviewed the instructor's guide for MTM. Course developers provided these guides to us when we attended and observed each class.

Course Observations and Outcome Reviews

Course observations. AIR staff observed at least one session of the classroom portion of each of the three training curricula. For MedTeams™, we observed the train-the-trainer portion of the L&D Team Coordination Course during fall 2002 in Boston, MA, and 11 sessions of the OR Team Coordination Course at a U.S. naval medical center during summer 2003. For MTM, we observed the train-the-trainer course that was conducted during summer 2003 at a U.S. Air Force base. Finally, for DOM, we observed a shortened version of the curriculum that was sponsored by the State Volunteer Mutual Insurance Company (Brentwood, TN) and two full-length sessions of the course that were conducted at a university's regional medical center.

Pre- and posttraining assessment tools. For each of the courses that were observed (except the MedTeams™ L&D Team Coordination Course and the shortened version of DOM), AIR staff administered pre- and posttraining assessment tools. The pretraining tool was designed to assess student experiences prior to training and gauge participant attitudes and beliefs about teamwork (see Appendix A). Pretraining experiences and participant attitudes have been shown to affect trainee motivation to learn and reactions to training.^{21,22} The posttraining tool measured participant affective and utility reactions to training (see Appendix B).

Instructor interviews. During our observations of MedTeams™ and MTM, we also conducted instructor interviews. With respect to MedTeams™, we interviewed 14 hospital staff members during the week of June 9-11, 2003, who served as instructors in a MedTeams™ program that week. With respect to MTM, we interviewed 10 individuals who were attending or had previously attended a train-the-trainer course. In all cases, instructors were asked about how they were selected, their background in training, and perceptions of the course and training aids used (see Appendix C). Interviews were not conducted with the two DOM instructors, because, unlike MedTeams™ and MTM, DOM does not utilize a train-the-trainer strategy. The course developer, Crew Training International (CTI), provides instructors for all administration of DOM training.

Description of the Participants

AIR staff interviewed 14 instructors, and collected pre- and posttraining assessments on 223 MedTeams™ participants; interviewed 10 participants and former participants, and collected pre- and posttraining assessments on 26 MTM participants; and collected 78 pre- and post-training assessments from DOM participants. Below we describe our findings from the pre-training assessment, which were used to determine if participants were similar across MedTeams™, MTM, and DOM training.

The pretraining results highlight some interesting similarities among the three groups of respondents (see Table 1). We began by reviewing their motivation to participate in medical team training. With the exception of one question (Question #3), nearly 50 percent or more of all participants had personally witnessed a breakdown in teamwork that could have compromised patient safety. In all cases, the two most frequently cited problems involved not learning from prior mistakes (Question #4), and poor preparation (Question #5). Fortunately, the participants did not report feeling pressured to perform procedures that they were not comfortable doing (Question #3). To empirically assess the similarity across the MedTeams™, MTM, and DOM participants, we ranked the percentage of agreement responses (within each program) and calculated the mean correlation across the three programs, using Spearman's correlation for ranked data (r_s). The average correlation was 0.69, indicating a moderate degree of similarity among participants.

We found similar results with regard to the participants' respective organizational cultures. In all cases, over 50 percent of the participants in each program agreed that their respective organizations promoted a positive safety culture (see Table 2). Participants in all three programs generally agreed that disruptions in patient care were the greatest detriments to patient safety (Question #8). However, they were uniformly less likely to agree that team members in their departments know each others' responsibilities (Question #9). Again, we calculated the mean correlation across the three programs, using Spearman's correlation for ranked data (r_s). The average correlation was 0.46, which is somewhat lower than their pretraining motivation levels. This was not unexpected, given that each facility is expected to have its own unique culture.

Table 1. Pretraining motivation (% “yes” responses)

Survey item	MedTeams™ (n=223)	MTM (n=26)	DOM (n=77)
1. Have you ever worked in a medical team where you did not feel comfortable voicing your professional opinion?	46%	58%	68%
2. Have you ever worked in a medical team where there was no clearly designated leader?	48%	46%	64%
3. Have you ever felt pressured to perform a medical procedure that you felt uncomfortable doing?	33%	46%	56%
4. Have you ever witnessed an actual or potential mishap that could have been prevented if the team had learned from their previous mistakes?	58%	63%	86%
5. Have you ever witnessed a routine medical procedure that went wrong because the team did not adequately prepare beforehand?	60%	50%	77%

Finally, we reviewed the participants’ belief in the importance of teamwork. The participants uniformly agreed that teamwork was important for ensuring patient safety. In fact, the percentage agreement for these items was generally greater than 80 percent and never went below 73 percent (see Table 3). Prior to participating in their respective MTT programs, the participants were uniformly confident in their ability to work effectively in a team environment (Question #12) and in their belief that people with strong teamwork skills are likely to be successful in health care (question #14). Again, we calculated the mean correlation among the three programs using Spearman’s correlation for ranked data (r_s). The average correlation was .73, indicating a moderate degree of similarity among participants.

In summary, although the results did differ slightly, there was a common pattern of responses across MedTeams™, MTM, and DOM participants. Regardless of the institution in which training was delivered, nearly half of all participants had witnessed a breakdown in teamwork that could have compromised patient safety (see Table 1). Despite this, many felt that their organizations exhibited elements of positive safety culture (see Table 2), and that teamwork skills are important for maintaining patient safety (see Table 3). Therefore, we conclude that participants in MedTeams™, MTM, and DOM possessed similar motivation to participate in training and learn the material. With that in mind, we present our case studies of MedTeams™, MTM, and DOM.

Table 2. Organizational culture (% agreement)

Survey Item	MedTeams™ (n=223)	MTM (n=26)	DOM (n=77)
6. The culture in our department makes it easy to learn from the mistakes of others.	68%	81%	51%
7. Our doctors, nurses, enlisted personnel, and other team members work together as a well-coordinated team.	57%	52%	63%
8. Disruptions in patient care can be detrimental to patient safety.	76%	88%	69%
9. Physicians, nurses, enlisted personnel, and other team members in this department know and understand each others' respective responsibilities.	53%	52%	54%
10. My department does a good job of training new personnel.	53%	58%	51%

Table 3. Belief in the importance of teamwork (% agreement)

Survey item	MedTeams™ (n=223)	MTM (n=26)	DOM (n=77)
11. Teamwork deserves more attention in health care.	81%	92%	97%
12. I am confident about my ability to work effectively in a team.	97%	96%	96%
13. Teamwork is one of the most important skills in the operating room (OR).	92%	92%	87%
14. People with strong teamwork skills are more likely to be successful in health care.	94%	100%	99%
15. It is impossible to function in health care without being a good team player.	73%	77%	81%

Chapter 2. Case Study 1—MedTeams™§

Introduction

The primary purpose of MedTeams™ is to reduce medical errors through interdisciplinary teamwork. MedTeams™ was developed by Dynamics Research Corporation (DRC), of Andover, MA, on the premise that most errors result from breakdowns in systems-level defenses that occur over time.²³ According to the MedTeams™ curriculum, each team member has a vested interest in maintaining patient safety and is expected to take an assertive role in breaking the chain of events leading to an error. MedTeams™ defines a core team as a group of 3–10 (average = 6) medical personnel who work interdependently during a shift and who have been trained to use specific teamwork behaviors to coordinate their clinical interactions.

Case Study Approach

Consistent with our plan, we were able to access several sources of information to evaluate MedTeams™ training. Specially, we reviewed all course materials for both the MedTeams™ Instructor Certification Course for Labor & Delivery (L&D) and the student guides for the Operating Room (OR) Course. We also reviewed the relevant research studies that have been published on the effectiveness of MedTeams™ training. In addition to our document review, we observed 1 day of the L&D train-the-trainer course and multiple sessions of the OR student course. At the OR course, we also were able to conduct a pretraining assessment of student experiences and expectations, a posttraining assessment of student reactions to MedTeams™, and interviews with 14 instructors. Each of these activities is briefly described in more detail below.

Document and Literature Review

Our document review identified eight articles, conference papers or technical reports published on the MedTeams™ approach. Key to our assessment of MedTeams™ training was a paper published by Morey and colleagues¹⁹ describing a quasi-experimental evaluation of the effectiveness of this training. Results from this paper are described when we review the additional evidence that supports the MedTeams™ approach.

In addition to reviewing the literature, we carefully reviewed the instructor and student guides from the L&D Team Coordination Course and the OR Team Coordination Course, respectively. DRC staff provided these guides to us when we attended and observed each of these curriculums.

Course Observations

AIR staff observed the train-the-trainer portion of the L&D Team Coordination Course during fall 2002 in Boston, MA. This course was taught by DRC as part of the large, on-going course validation study. A variety of staff attended this training from hospitals randomly assigned to the experimental condition for the study. AIR staff observed 1 day of a multiday course, which is designed to certify hospital staff as MedTeams™ instructors (as well as meet the requirements for participation in the L&D study). The observed day involved DRC instructors providing the MedTeams™ classroom training to the future instructors. Essentially,

§ Note: Appendixes cited in this report are provided electronically at <http://www.ahrq.gov/qual/teamtrain/index.html#app>.

the purpose of this day was to demonstrate how the classroom portion of MedTeams™ was to be conducted. On a subsequent day, the instructor trainees would practice delivering this training. This session was not observed.

In addition to the L&D course, AIR staff observed the OR Team Coordination Course at a U.S. naval medical center during summer 2003. Twelve classes were conducted over a 1-week period, including two for the ophthalmology service, one for the dental service, three for the orthopedic service, one for the urology service, one for plastic surgery, two for general surgery, one for the cardiothoracic service, and one for the neurology group. Hospital staff who had previously completed the MedTeams™ instructor certification course and had been certified as MedTeams™ instructors taught these courses. We observed the didactic portion of this training.

Pre- and Posttraining Assessment Tools

In addition to observing the courses, AIR administered pre- and posttraining assessment tools to 223 participants in MedTeams™ training. The pretraining assessment tool was designed to assess student experiences prior to training and gauge participant attitudes and beliefs about teamwork. The results from this measure were described in an earlier section of this report entitled, “Description of the Participants” (p. 12–14). The posttraining assessment tool measured participant utility reactions to MedTeams™ training. All attendees completed the pretraining tool, but only 218 completed the posttraining tool. Of the 223 students, 94 were physicians, dentists, or oral surgeons; 62 were corpsmen; 44 were nurses; and 23 represented other groups, such as surgical technicians.

Instructor Interviews

AIR staff also interviewed 14 hospital staff who conducted the observed MedTeams™ training. Interviews were conducted with trained instructors from the cardiothoracic, dentistry, general surgery, neurology, ophthalmology, orthopedics, plastic surgery, and urology groups. The pool of instructors included department heads, physicians, nurses, and surgical technicians. Instructors were asked about how they were selected to teach MedTeams™, their training background, and the flow of the course and training aids used (see Appendix C for the Instructor Interview Form).

Below, we present the results from our analysis of this information. These results are organized around a set of variables that we used to draw conclusions about each training program. For each variable we provide descriptive data from our literature review and then findings from our observations, data collections, and interviews when appropriate. Table 4 provides a summary of this information for each of the three training programs reviewed.

Results

Theoretical Basis

The core objectives, curriculum, and instructional strategies for initial MedTeams™ training for emergency departments (EDs) were derived from a CRM training program that was originally developed for U.S. Army helicopter crews to train them in specific behavioral skills.^{23,24} The MedTeams™ developers argued that emergency medicine and aviation share a number of similarities, making CRM training for helicopter crews portable to the ED. These similarities include: the need for decisionmaking based on incomplete or conflicting information; the demand for coordination among professionals with varied skills and ranks; and the possibility of poor team performance leading to serious consequences or death. Since the development of

the emergency department course, MedTeams™ training has been developed for the L&D Service and the OR. These courses are based on the initial emergency department (ED) course, but case studies and examples have been modified to make MedTeams™ contextually appropriate for the service in which it is implemented.

Analysis of Training Needs

As part of the initial MedTeams™ development process for the ED, DRC conducted an analysis of team performance deficiencies. They analyzed the closed-case files from eight hospitals that were collected over a period of several years. Each file was then classified using a teamwork failure checklist to identify trends. Their analyses identified approximately 8.8 teamwork failures per closed case. Based on their analyses, DRC concluded that improved teamwork could have saved the hospitals approximately \$3.50 per ED patient visit.^{23,25,26} By way of comparison, malpractice costs range between \$2-\$6 per patient.

The initial version of MedTeams™ was developed using an evaluation-driven course design. Based on the closed-case file review, DRC identified five critical teamwork dimensions that were necessary for effective teamwork. They then identified 48 specific, observable behaviors that were linked to these dimensions, and developed Behaviorally Anchored Rating Scales (BARS) for each behavior. Finally, they reviewed and refined the curriculum during three 5-day expert panels that included ED physicians and nurses from 12 hospitals of various sizes.^{25,26}

Training Objectives

The overarching objective of MedTeams™ curriculum is to reduce medical errors through training interdisciplinary teamwork skills. MedTeams™ was developed on the premise that most errors result from breakdowns in systems-level defenses that occur over time. According to the MedTeams™ curriculum, each team member has a vested interest in maintaining patient safety and is expected to take an assertive role in breaking the error chain. MedTeams™ defines a core team as a group of 3–10 (average = 6) medical personnel who work interdependently during a shift, and who have been trained to use specific teamwork behaviors to coordinate their clinical interactions. Each core team includes at least one physician and one nurse. A coordinating team manages several core teams, assigns new patients to the core teams and provides additional resources as necessary.^{23,25,26}

Table 4. Summary of medical team training program content

<i>Evaluation Items</i>	<i>Programs</i>		
	MedTeams™	MTM	DOM
<i>Theoretical Basis</i>	➤ Based on the CRM* training program developed to train U.S. Army helicopter crews	➤ Based on the U.S Air Force's fighter pilot CRM training program	➤ Based on CRM training from military and commercial aviation
<i>Needs Analysis</i>	➤ Analyzed the closed- case files from eight hospitals	➤ Teamwork and communication as root cause of sentinel event	➤ No known in-depth analysis
<i>Training Objectives</i>	➤ Reduce medical errors through interdisciplinary teamwork	➤ Reduce medical errors by teaching human factors concepts to interdisciplinary teams of medical professionals ➤ Change the military's medical culture	➤ Apply aviation safety practices to health care
<i>Training Content</i> <i>Knowledge</i>	➤ Knowledge of the components of teamwork ➤ Situational awareness	➤ Knowledge of the components of teamwork ➤ Situational awareness	➤ Knowledge of the components of teamwork ➤ Situational awareness
	<i>Skills</i>	Available resources ➤ Policy/Regulations ➤ Leadership ➤ Identification of impaired performance ➤ Workload performance ➤ Communication skills	➤ Managing fatigue ➤ Decisionmaking ➤ Recognizing adverse situations ➤ Cross-check and communication
	➤ Maintaining team structure and climate ➤ Problem-solving skills ➤ Execution of plans and management of workload ➤ Communication skills		

Table 4. Summary of medical team training program content (cont.)

* CRM = Crew Resource Management

Training Content

Evaluation Items	Programs		
	MedTeams™	MTM	DOM
Skills (cont.)	<ul style="list-style-type: none"> ➤ Team performance improvement skills (e.g., teamwork review, situational learning, peer coaching) 	<ul style="list-style-type: none"> ➤ Operating strategy ➤ Recognition of obstacles to effective teamwork and communication 	<ul style="list-style-type: none"> ➤ Performance feedback
Instructors	<ul style="list-style-type: none"> ➤ Train-the-trainer ➤ MedTeams™ Certified instructors 	<ul style="list-style-type: none"> ➤ Train-the-trainer 	<ul style="list-style-type: none"> ➤ Crew Training International Instructors
Instruction Strategies	<ul style="list-style-type: none"> ➤ 8 hours of classroom instruction ➤ 1 hour of behavioral modeling, using videotaped vignettes ➤ 1 hour of integration/synthesis 	<ul style="list-style-type: none"> ➤ Didactic lectures ➤ Seminar participation ➤ Application questions ➤ Behavioral modeling ➤ Videotaped vignettes ➤ Case study analyses 	<ul style="list-style-type: none"> ➤ 8 hours of classroom training, including: lectures, demonstrations, case studies, and role plays
Practice/Feedback	<ul style="list-style-type: none"> ➤ 4 hours of on-site practica ➤ Routine team meetings 6 months after the training 	<ul style="list-style-type: none"> ➤ Instructors' observations and feedback ➤ Homework assignments ➤ Case studies 	<ul style="list-style-type: none"> ➤ Development and implementation of checklists and other tools
Recurrency	None	None	None
Evaluation	<ul style="list-style-type: none"> ➤ Trainee reactions 	<ul style="list-style-type: none"> ➤ Trainee reaction 	<ul style="list-style-type: none"> ➤ Trainee reaction ➤ Human Factors Attitude Survey

The MedTeams™ course consisted of a brief background on teams and an introduction to DoD Patient Safety initiatives. In addition, detailed information on six substantive modules was presented. Each module was structured around specific learning objectives. These objectives were likely derived from the results of the needs analysis that was described earlier but we could uncover no evidence to support this hypothesis. Finally, modules did not include any in-class assessments to ensure that participants had achieved the stated learning objectives. The six modules were as follows:

1. Maintain Team Structure and Climate
2. Plan and Problem Solve
3. Communicate with the Team
4. Manage Workload

5. Improve Team Skills

6. Integration Unit

The first module (“Maintain Team Structure and Climate”) included information about the composition of core teams, team leader and team member roles, team structure, and team climate. It also presented a technique for managing conflict: the DESC² Script, which encourages *d*escribing the situation, *e*xpressing concerns about the action, *s*uggesting alternatives, *s*tating consequences, and *o*btaining consensus.

The “Plan and Problem Solve” module taught skills such as planning, using shared mental models, cross-monitoring, using assertion and advocacy, and using the two-challenge rule. Planning consisted of both long-term and situational planning, such as responding to emergencies. Shared mental models ensure that team members have the same understanding about the situation and/or problem. The remaining discussion focused on encouraging team members to voice their concerns in order to prevent errors.

“Communication” was the theme for the third module. This module taught information about situational awareness and the standards of effective communication (e.g., clear, timely, complete, and verified). Information transfer skills that encourage clarification of information, such as check-backs, call-outs, and hand-offs, are also part of the communication module.

“Managing Workload” was the fourth section. This module focused on workload information and skills for managing workload, such as resource management, prioritization, delegation, and task assistance.

The “Improving Team Skills” module consisted of information about performance goals and feedback, including characteristics of effective feedback. Performance improvement skills, such as teamwork reviews conducted at the end of a clinical event or near the end of a shift, situational teaching, and peer coaching, were explained. Situational learning involves encouraging questions, while peer coaching consists of monitoring team members’ performance and instructing team members.

Finally, the last unit was the “Integration Unit.” The purpose of this module was to discuss implementation issues such as staff expectations of implementation, team implementation plans, and sustainment issues, such as the strengths and weaknesses of teamwork systems and action plans for managing obstacles to implementation. In addition, the curriculum contained a teamwork simulation, in which the class was divided into a simulation team and an observation team. The instructor selected the scenario from a Simulation Matrix, the simulation team enacted the scenario using teamwork skills, and the observation team then rated the team on its teamwork actions. Time permitting, students then changed teams and enacted another scenario. This module was designed to be an open discussion among the students; however, the simulation was cut short or not done in many of the classes due to time constraints.

Instructor Selection, Training, and Preparation

Description. As mentioned previously, MedTeamsTM uses a train-the-trainer approach to implement the training. Individuals designated by their facility receive comprehensive training. DRC requests that designated instructors be:

- Viewed as advocates of teamwork

- Members of a physician/nurse/technician training team
- Viewed as leaders among their peers and service administrators
- In positions that allow flexibility in scheduling

At the end of the train-the-trainer course, these individuals are certified as MedTeams™ instructors. Certification requires instructors to complete MedTeams™ training, complete the Instructor Certification Course, complete the practice teaching and coaching prerequisites, and pass a written exam with a score of no less than 80 percent. MedTeams™ instructors are then responsible for implementing MedTeams™ training at their health care organization.

Findings. Observations of the train-the-trainer course in Boston and a review of the L&D instructor manual indicated that MedTeams™ uses a variety of control mechanisms to ensure instructor quality. These include standards for instructor selection, an instructor certification course, opportunities to practice and receive feedback on teaching and coaching, and an assessment of team and course knowledge through a written test. We conclude from reviewing this information that this train-the-trainer strategy should produce knowledgeable instructors who provide high quality, reliable training at their facilities.

To cross-validate our finding, we interviewed 14 MedTeams™-certified instructors who conducted training at the naval medical center we visited. As part of these interviews, we asked these individuals how they were selected and how they were prepared to teach the OR course. Findings from these interviews are presented in the following paragraphs.

First, regarding instructor selection, interviewees provided a variety of reasons as to why they were selected to teach the MedTeams™ curriculum for the OR. For example, interviewees reported that department heads were required to teach at least one session of the course, but a few department heads delegated their responsibility to other people. Some instructors thought that senior physicians were chosen to teach the course in order to encourage attendees to focus on the course. A few thought that they were chosen at random; others thought that they were selected due to previous training experiences. Two individuals felt that they were chosen because they are the continuous improvement (CI) representatives for their departments. Two instructors were involved with the development of the OR version of MedTeams™; thus, they were willing to participate.

Regarding preparation, instructors spent a variety of time periods preparing to teach the OR course. Most spent between 2 and 6 hours, with several spending 8 hours or more in planning. Most instructors spent between 2 and 4 hours as a group preparing to conduct the class, and then spent additional time reviewing the curriculum on their own.

Besides the MedTeams™ instructor certification course, there was no additional training or preparation required to teach the course. However, even with the extensive activities included in the certification course, most instructors did not feel adequately prepared to conduct MedTeams™ training. Several mentioned that they were not aware that they would become instructors for the course until the end of the train-the-trainer session, even though at the onset of the train-the-trainer course they were notified that they would ultimately be teaching MedTeams™. Most felt that they needed more time to become familiar with the materials; several mentioned that they did not receive the materials until the end of the week before they were supposed to teach the course. In contrast, another group of instructors felt well-prepared, but they also had familiarity with MedTeams™ prior to teaching the course.

Instructional Strategies

Description. MedTeams™ purports to employ a variety of training methods that address two of the three recommended phases of CRM training: Awareness and Practice-and-Feedback. The Continual Reinforcement phase is not directly addressed, although it could be argued that this occurs through the on-going practice of MedTeams™ training and the implementation of several sustainment strategies.

Regarding awareness, this phase includes 8 hours of classroom instruction, 1 hour of behavioral modeling using videotaped vignettes, and 1 hour of integration/synthesis.²⁵ Once the classroom training portion of the course is complete, each team member participates in a 4-hour practicum that involves practicing teamwork behaviors and receiving feedback from a trained instructor (Practice and Feedback Phase). Coaching, mentoring, and review sessions are also provided during regular work shifts. The post-classroom component of training lasts for approximately 6 months.

Findings. We observed portions of 11 classes during our visit to the naval medical center during summer 2003. Classes varied from 3 to 7 hours. Classes varied primarily as a function of the instructor and how that individual chose to conduct the course. For example, some instructors simply read the slides and did not add much detail or explanation. Other instructors used a more interactive style, engaging the attendees in discussions, obtaining examples from their specialties, and even calling on individuals when necessary.

Most instructors utilized the vignettes to demonstrate key points during training; a few instructors even customized or wrote new vignettes tailored to their specialty (e.g. ophthalmology). Most instructors showed the videos. However, few, if any, instructors actually conducted the practice exercises. The primary reason for skipping these activities was the lack of time.

In addition to our observations, we asked students to indicate the extent to which they agreed with the statement, “The training was well organized.” Somewhat in contrast to what we observed, 96 percent of the students agreed or strongly agreed with this statement (see Table 4). The vast majority of students also reported that the training content was appropriate for their department.

In summary, it should be noted that we were only able to view the in-class portion of MedTeams™ training. Observations and other data were not collected on any posttraining implementation strategies. Regarding the classroom component, our observations and instructor interviews suggest that there was wide variation in how instructors implemented MedTeams™ training. Overall, classes varied from 3 to 7 hours. Even though instructors were trained and certified, how the course was implemented and conducted was left to the discretion of the instructors and the quality of instruction varied considerably. The instructional strategies that we observed (lectures, case studies, and video demonstrations), when they were implemented properly, seemed to be effective at achieving the desired objectives. However, because one of the core objectives of MedTeams™ is to enhance the team skills of the participants, we would have liked to see more instructors implement the role-play exercises. Nonetheless, student reactions to the organization of the course and its appropriateness were extremely positive.

Training Effectiveness

Description. The classroom-based phase of MedTeams™ primarily relies upon the collection of trainee reactions (Kirkpatrick’s Level I data) to determine training effectiveness.

The Emergency Team Coordination Course[®] Evaluation Form (© 1997 Dynamics Research Corporation) is used for this purpose. For the OR course, trainees were asked to rate the extent to which MedTeams[™] training achieved its purpose and goals, met its stated objectives, and was well organized. In addition, participants were asked to assess the quality of the instruction. One item addressed the expertise of the instructor, and the other addressed the appropriateness of the instructional strategies for achieving the desired objectives.

Findings. To assess MedTeams[™] effectiveness, we collected additional, independent data on both trainee and instructor reactions to the course. Utility reaction data¹³ were collected from participants and, as mentioned, interviews were conducted with instructors. In addition, we reviewed the existing empirical literature that has been reported regarding Kirkpatrick's Level II (Knowledge), Level III (Behavior), and Level IV (Results). Specifically, we reviewed a quasi-experiment that examined the effectiveness of MedTeams[™] in the ED that was conducted by Morey and colleagues.¹⁹ Below, we describe our findings from these activities.

Level I data. Participants in the OR course responded favorably to the training. Overall, participants liked the content of the course and felt that it was useful. The course met their expectations, in part, due to the content and issues, with respect to departmental problems and communication problems that were raised. More specifically, attendees felt the content was well-organized (96 percent agreement; see Table 5) and appropriate for their department (92 percent agreement). Almost all attendees felt confident that they understood the material, could perform teamwork tasks, and could apply the course material to their jobs. Though these ratings also were high, there was slightly less agreement that the training was an effective use of time (77 percent) and that the training prepared attendees to work effectively in their jobs (78 percent).

Table 5. Posttraining opinions about MedTeams[™]

	Total Responses (n=218)				
<i>Item</i>	Mean	Std. Dev.	Percentage Agreement	Percentage Neutral	Percentage Disagreement
The training was well-organized.	4.4	.68	96%	2%	2%
I am confident that I can perform the tasks that were trained.	4.4	.58	96%	3%	1%
I am confident that I understood the training content.	4.5	.60	96%	3%	1%
I am confident that I can use the knowledge that I learned on the job.	4.4	.69	94%	5%	1%
The training content was appropriate for my department.	4.3	.72	92%	6%	2%
Training will help my department improve patient safety.	4.1	.81	83%	14%	3%

As a result of this training, I feel more confident about my ability to work effectively in a team.	4.1	.83	80%	17%	3%
Training prepared me to work effectively in my job.	4.0	.82	78%	18%	4%
Training was an effective use of my time.	3.9	.95	77%	14%	9%

When asked about any changes that could be made to the course, a little less than half of attendees felt that nothing should be changed. Those who felt that changes should be made wanted more interaction with others, including group activities and role-plays, and more videos, vignettes, and case scenarios. Several participants suggested shortening the course, and a few felt that the course was redundant in parts and could be condensed.

Almost all attendees would recommend this training course to other people at work. The main reason for recommending the course is the need for other co-workers to learn about teamwork and improve their teamwork skills, particularly communication.

Likewise, instructors were pleased with the course. They felt that the sequence and flow of the course were appropriate. The training aids (e.g., videos, vignettes) were also identified as being useful. A few instructors noted that Module 1 (“Maintain Team Structure and Climate”) appeared to be the most important and that the videos in the beginning helped to gain trainees’ attention. However, a few instructors felt that there were almost too many videos and that it might be better to include fewer. Suggestions for other training aids included more interactive handouts that encourage participation and vignettes with OR-relevant examples. Better audio-visual coordination was another suggestion.

Instructors felt that the communication module and the frustration exercise were two of the best features of the course. The frustration exercise (i.e., having the group voice their frustrations with the OR) proved to be very useful. Participant frustrations were written down on a flip chart, and several instructors linked the frustrations back to specific components of MedTeams™ towards the end of the course. This activity added validity to the MedTeams™ training by showing how it can help alleviate or reduce some of the attendees’ frustrations. Other key features that were cited by instructors included:

- Pre-packaged materials (e.g., slides and student’s manual)
- Videos
- Basic nature of training (i.e., easy to understand)
- Training crosses all skill levels/allows for face time with all groups involved in the OR/gets surgeons involved
- Patient-safety focus of training
- Identification of solutions to common problems

Instructors felt that less time could be spent on self-explanatory information. According to instructors, specific components of the course that could use improvement include Modules 4

and 6 (“Manage Workload” and “Integration”). Module 4 is dense and difficult for many participants to understand; several felt that Module 4 (“Workload”) should be revised and shortened. In particular, the concept of “task assistance” was particularly difficult for some trainees to grasp. Module 6 does not do a good job of wrapping up the course, according to several instructors. The simulations (i.e., role-plays of teamwork skills) included in Module 6 encourage lengthy discussions instead of reviewing the key points of the course.

Almost all instructors noted that the examples in the course should be made more relevant to an OR. A few instructors recommended improving the audio-visual integration; one suggested including markers in the text to cue instructors for upcoming videos and vignettes. Other recommendations from the instructors included the following:

- Include the frustrations exercise in the curriculum
- Re-arrange the curriculum to put the most important information up front
- Consider the OR environment (some terms are too “touchy-feely” or “hokey”) and address people’s roles
- Improve organization and planning for the course (e.g., the lack of preparation time)
- Place greater emphasis on the following items:
 - Integration (i.e., How will the training be implemented? How will it work?)
 - Communication
 - Improvement of team skills
 - OR-based videos and practical exercises
 - Involvement of the surgeons (e.g., focusing on the patient and working with the team)

Finally, interviewers asked the instructors what the likelihood is that the training will be successful in their departments. Several believed that there would be a 40-50 percent chance of success due to anticipated difficulties with implementation. One of the major concerns voiced was that individuals in the OR do not have enough time or staff to keep the training going and ensure its successful implementation. To address this issue, one instructor suggested moving the responsibility for the training course to the Staff, Education, and Training Group (SEAT). Another concern was that many of the surgeons had not bought into the training and felt that it was a “waste of their time;” thus, they might not be willing to implement it. A third concern was the length of the training and the need for refresher training. Additionally, several instructors felt that the DoD should put more resources into the training (e.g., organization and preparation). In contrast, a few instructors felt that there was high likelihood that the training would work, but it would depend on training and sustainment. According to many instructors, as long as leadership supports the training, it will be implemented, and everyone new who comes in will get the training.

Level II, III, and IV data. There has been one major evaluation of the MedTeams™ approach in emergency departments¹⁹ and another is underway in labor and delivery units.²⁷ The ED study¹⁹ involved a multisite, single-crossover, quasi-experimental design. In this study, nine EDs (six in the experimental group and three in the control group) were observed during a 14-month interval that encompassed pretraining baseline measures, the training intervention proper, and

posttraining evaluations. A suite of 17 process and performance measures was collected. To ensure rating accuracy, all observation-based measures were collected by trained raters, and measures of interrater agreement were periodically conducted to ensure that the raters remained calibrated. Finally, because data were clustered, Generalized Estimating Equations (GEE) were used to test the effect of the hospital-level intervention using case-level data. The results suggested that, in contrast to the control group, the trained groups showed significant gains in teamwork-related knowledge, skills, and attitudes; that the intervention did not increase self-reported task workload; and that the error rate decreased sharply.

The second study is ongoing in L&D units in civilian and military hospitals.²⁸ Unlike the previous study, in which the EDs chose to participate in either the experimental or control conditions, this study was designed as a randomized clinical trial. Based on an a priori power analysis, 24 hospital L&D units were randomly assigned to participate in either the experimental or control conditions (up to 12 per condition). Many other aspects of the L&D study mirror that of Simon and colleagues²⁴ with multiple performance measures that focus on patient outcomes, team process, and staff and patient satisfaction.²⁷ However, unlike the ED investigation, performance ratings on the team skills taught in MedTeamsTM will not be collected. Rather proxy measures, such as the time it takes for new patients to be processed through hospital admissions and the time interval between deciding to do a C-section and initial incision, will be recorded. Data collection for the L&D study was expected to be completed in the spring of 2004, however, the findings have not yet been published.

Strengths and Weaknesses

Strengths. Our review of the literature, observations of the classroom phase, instructor interviews, and posttraining assessment suggest that MedTeamsTM has a number of desirable qualities. First, the original courseware for the ED was based on a thorough up-front needs analysis. This analysis resulted in the five core dimensions on which MedTeamsTM training is based. Second, MedTeamsTM employs a very practical system for implementing the training. Designated staff members from a specific facility are trained and certified as MedTeamsTM instructors, and then these staff members conduct MedTeamsTM training at their facilities (i.e., a train-the-trainer strategy). Moreover, our review of the “L&D Team Coordination Course” for instructors suggests that instructor training is comprehensive and thorough. Third, our independent collection of posttraining reactions suggests that participants had positive reactions to MedTeamsTM training. Participants indicated that the training was well organized, and they felt that they could use many of the strategies that were discussed during training upon returning to their jobs. Finally, the MedTeamsTM developers have made the most extensive efforts to collect Level II and III data to demonstrate the effectiveness of MedTeamsTM.^{19,27} Although the initial investigation suffered several design flaws, which make the results somewhat tentative, it was one of the few efforts in the academic literature to link team process to health outcomes. Hopefully, the L&D study will shed additional light on these relationships and the utility of MedTeamsTM.

Weaknesses. Nevertheless, MedTeamsTM does have its limitations. First, although a comprehensive needs analysis was performed to develop the ED curriculum, no subsequent in-depth needs analyses were conducted to develop the L&D and OR courses. Essentially, subject matter experts reviewed the training materials and customized the case studies and other examples when appropriate. We question this approach, because a panel of leading experts in the field that was convened by AIR in January 2002 suggested that team knowledge, skills, and

attitudes are likely to vary by medical specialty as well as other factors (see Appendix E). Second, we were surprised by the variation in how the classroom phase was administered by trained, certified MedTeams™ instructors. Classes ranged from 3 to 7 hours and the quality of this instruction varied greatly. Despite the MedTeams™ developers' best efforts to ensure consistency of instruction, consistency was lacking. Also, while one of the main objectives of MedTeams™ is to develop team skills, much of the classroom instruction focused on mastering declarative and some procedural knowledge. There was substantially less time devoted to skills practice. Third, MedTeams™ did not employ a cultural assessment/evaluation component prior to implementing the training. As a result, it is entirely possible that MedTeams™ is effective only in hospitals that have already made a commitment to teamwork, secured upper-level management support, established an open, nonpunitive atmosphere that embraces errors as an opportunity for learning, and recognized the need for change. It is interesting to note that results from our pretraining assessment suggest that this particular naval medical center has a culture that supports teamwork. Fourth, trainee reactions to MedTeams™ were positive despite the tremendous variability in instruction. However, and quite in contrast to the positive reactions, several of the instructors we interviewed said that there was only a 40-50 percent chance of this training being successful when implemented. Finally, one of the limitations of MedTeams™ is the delay in the implementation of the actual strategies. All departmental staff must receive the classroom phase before implementation. Although this appears to be a reasonable approach, especially when training a large number of people, there can be considerable delay between classroom training and implementation. For example, we visited the naval medical center again in early July 2003. At that time, OR staff training had not been completed. Such a delay could result in a decay of important knowledge and strategies that were developed during training.

Summary

In conclusion, the MedTeams™ course was well received. The content covered the basics of teamwork and, for the most part, students and instructors felt that it delivered a good message: teamwork is important. The course met students' expectations, and most would recommend the class to coworkers. The frustration exercise was identified as the most popular activity in the class. Both students and instructors liked the interaction between physicians, nurses, and medical technicians that resulted from the exercise. They felt that it was a good way to raise awareness about issues and concerns from different health care professionals' perspectives. It also tied in nicely with the modules of the course, as many of the concerns were addressed in the modules. However, instructor variability plagued the actual conduct of the training. Moreover, many attendees were frustrated by the length of the course as well as the over reliance on lectures as the primary instructional strategy. Many would prefer to break the lecture portion up with more videos, case scenarios, and group discussions. In addition, many wanted more examples that were directly relevant to the OR.

Chapter 3. Case Study 2—Medical Team Management^{}**

Introduction

The primary purpose of Medical Team Management (MTM) is to reduce medical errors through interdisciplinary team training. MTM was modeled on the U.S. Air Force's CRM training program for fighter pilots and was developed after poor teamwork was identified as the root cause of a medical event that led to a catastrophic patient outcome.

The MTM training program has two major components: a 3-day train-the-trainer course and a medical treatment facility course. Upon completing the train-the-trainer course, graduates return to their respective medical facilities to train the remaining staff in teamwork principles.²⁹ The MTM curriculum includes an introduction to the program, overviews of key patient safety and CRM issues, and specific modules for seven foundational elements: leadership, workload performance, policy and regulations, situational awareness, available resources, communication and operating strategy. In addition the curriculum includes obstacles to effective teamwork, and tools (behaviors) for improved teamwork and communication. Case studies, vignettes, and tools (e.g., the "two attempt" rule) are interspersed throughout the curriculum to reinforce the importance of effective teamwork.

Case Study Approach

We were able to access several sources of information to assess MTM. Specifically, we reviewed the course materials for the MTM train-the-trainer course, the MTM Handbook, and the MTM implementation guidelines. In addition to our document review, we observed the 3-day train-the-trainer course, collected pretraining data on student experiences and expectations, collected posttraining data on student reactions to MTM, and interviewed several current and former participants. Each of these activities is described in more detail below.

Document and Literature Review

As part of a larger state-of-the-art literature review, AIR conducted a document review on medical team training and specific medical team training programs, including MTM. Unlike MedTeamsTM, there were no published articles, conference proceedings, or technical reports that document the effectiveness of MTM. However, we carefully reviewed the MTM train-the-trainer toolkit, the MTM Handbook, and the MTM implementation guidelines, which were provided to us prior to attending the train-the-trainer course.

Course Observations

AIR staff members observed the MTM train-the-trainer course, which took place at a U.S. Air Force base during summer 2003. As described in the MTM curriculum, the train-the-trainer course lasted 3 full days. The first day consisted of an introduction to MTM, along with modules on the foundational elements. The second day focused on the obstacles to effective teamwork, MTM tools, case studies, videotaped vignettes, and implementation guidance. The final day consisted of student-led case studies, a posttraining wrap-up, and student-led feedback.

^{**} Note: Appendixes cited in this report are provided electronically at <http://www.ahrq.gov/qual/teamtrain/index.html#app>.

Pre- and Posttraining Assessment Tools

In addition to observing the MTM train-the-trainer course, AIR staff administered the pre- and posttraining assessment tools to MTM participants. The pretraining tool was designed to assess experiences prior to training and to gauge attitudes and beliefs about teamwork. The posttraining tool measured participant utility reactions to MTM.^{††} The attendees represented a variety of medical specialties including anesthesia, cardio-thoracic medicine, dentistry, OB/GYN, internal medicine, physical therapy, emergency medicine, and pharmacy. Approximately one-third of them were currently involved in some form of patient safety or quality assurance programs at their respective medical facilities. Of the 26 participants surveyed, 3 were physicians, 12 were nurses, and 11 represented other groups such as medical technicians, physical therapists, pharmacists, and dental technicians.

Participant Interviews

During our visit, we also interviewed 10 individuals, two of whom had attended a previous train-the-trainer course. Participants were asked about how they were selected to teach MTM, their training background, and their perceptions of the flow of the course and training aids which were used. In addition, they were asked to name the three best features of the course and three that could use improvement, as well as any major obstacles to implementation. Finally, they were asked how they felt their coworkers might respond to the MTM course, and when they expected the training to be implemented at their respective medical facilities (see Appendix C).

Below we present the results of this case study. These results are organized around the same set of variables that we used to draw conclusions about MedTeamsTM. For each variable, we provide descriptive data from our literature review and then findings from our observations, data collections, and interviews when appropriate. Table 4 (p.18-19) provides a summary of this information for each of the three training programs that we reviewed.

Results

Theoretical Basis

The core objectives, curriculum, and instructional strategies for MTM were derived from the U.S. Air Force's aviation CRM training course. Like MedTeamsTM, the MTM course developers argued that medicine and aviation share a number of similarities, thereby making CRM training for pilots portable to health care. However, unlike MedTeamsTM, which has been tailored to specific medical specialties (e.g., ED, OR, L&D), MTM was designed to be a generic course that can apply equally well in a variety of medical specialty and support areas with little or no modification.

Analysis of Training Needs

MTM was developed after an adverse event resulted in a newborn developing severe neurological problems.³⁰ Although not part of a formal needs assessment, the need for communication and team training was validated by a subsequent review of 60 closed cases. The reviewers identified poor communication as the primary cause (74 percent) of otherwise

^{††} We administered posttraining tools after the second day of training. Even though this was a train-the-trainer class and participants were future MTM instructors, the first 2 days of the course were devoted to demonstrating MTM training.

preventable adverse events, providing further support for MTM. Drill-down analyses suggested that these 60 cases resulted in 92 separate errors. Furthermore, in cases where communication was an issue, there was an average of two errors per case.⁸

Training Objectives

The primary purpose of MTM is to reduce medical errors by teaching human factors concepts to interdisciplinary teams of medical professionals.^{8,31} A secondary purpose is to change the military's medical culture. Traditionally, the culture has focused on individual performance and, in doing so, has created obstacles to communication. MTM was specifically developed to foster a culture that values team performance and encourages effective communication across medical specialty areas and throughout the chain of command.³²

Training Content

The MTM training program covers seven foundational elements:

1. Leadership
2. Workload Performance
3. Policy and Regulations
4. Available Resources
5. Situational Awareness
6. Communication
7. Operating Strategy

In addition, obstacles to effective communication and teamwork and tools, or desired behaviors, are critical elements taught in MTM. All are designed to improve participants' knowledge and skills in these core areas.

The "Leadership" module highlights the differences between leadership and authority, and provides techniques for regulating information flow, directing team activities, motivating team members, and making effective team decisions. The "Workload Performance" module highlights the curvilinear effect of workload on performance—that performance worsens when workload is either too high or too low. It also provides techniques for identifying and dealing with high levels of workload, distraction, stress, and fatigue. The "Policy and Regulations" module focuses on the importance of following guidelines for maintaining patient safety, the various reasons for departing from established guidelines, and the consequences of doing so. The "Available Resources" module discusses using all assets, such as team members, equipment, skills, and all information available to the medical team. It describes both internal and external resources and emphasizes that thorough and effective use of these resources maximizes safety. The "Situational Awareness" (SA) module defines the concept of situational awareness, provides cues to determine if team members have lost SA, and suggests techniques for maintaining SA. The "Communication" module identifies the various forms of verbal and nonverbal communication. It also identifies principles for effective communication, obstacles to effective communication, and real-life examples of communication problems between health care providers. The "Operating Strategy" module provides recommendations for integrating the various teamwork issues. It also highlights the role of shared mental models, which develop as team members interact over time and shows how shared mental models can improve team performance. The

“Obstacles to Effective Teamwork” module identifies a number of factors—such as excessive professional courtesy, the halo effect, and hidden agendas—that cause breakdowns in team communication and set the stage for medical errors. The final module teaches tools, or desired behaviors such as the “I’M SAFE checklist,” “assertive statement,” and “two attempt” rule for combating obstacles and improving teamwork.

Instructor Selection, Training and Preparation

Description. Our review of MTM documents found that the U. S. Air Force requests that candidate MTM instructor have at least 5 years of clinical experience in their specialty areas. In addition, instructors should have at least 1 year of retainability in the armed forces, must be a competent speaker, and are expected to have previous experience delivering training.

Findings. Although MTM has specific requirements for MTM instructors, we could not identify any formal procedure for selecting potential MTM trainers. Our interviews with the MTM participants suggested that most were either recommended by a senior officer, or had volunteered because of their personal interest in maintaining patient safety. The participants came from a variety of medical specialties (from surgeons to medical technicians), and included enlisted to mid-level officers (from E-5s to O-6s). This mix was not unexpected because MTM was designed to be an interdisciplinary training course, which encourages open and effective communication, regardless of rank and content domain.

Instructional Strategies

Description. MTM employs a variety of training methods. These include computer-based instruction (which has temporarily been suspended), didactic lectures, seminar participation, application questions, behavioral modeling, and case studies.^{31,33,34} The trainees are also required to complete a variety of homework assignments. One involved observing one’s own team to identify obstacles that hinder effective team performance. Another requires the trainees to practice the tools that they have learned in the workplace. The trainees then identify the lessons that they have learned and discuss them at subsequent training sessions.³⁵

Findings. During the train-the-trainer course, we observed didactic lectures, seminar participation, application questions, and case study analyses. The case studies were a significant portion of the class, as the instructors went over the technique on the second day and assigned students to develop their own case study for the next day. On the third day, the participants discussed their case studies in small groups. The participants generally seemed to enjoy this exercise, and many recommended including more case studies in future MTM train-the-trainer courses (see Table 6).

A number of techniques for sustaining and reinforcing the human factors concepts discussed were also included in MTM training. For example, a module on the third day was devoted to sustainment issues, especially in unanticipated situations. Topics included long-term planning, briefings, and continuous monitoring of operations.

In summary it should be noted that we were only able to view the in-class portion of the 3-day train-the-trainer course for MTM. Therefore, unlike MedTeamsTM and DOM, trainees were future MTM instructors not participants. Our observations suggested that the first day of MTM training was an orientation day; essentially instructors received MTM training. Therefore, we believe that the results we collected on our posttraining measure are representative. With that in mind, we now turn to these findings.

Training Effectiveness

Description. The MTM instructors administered an evaluation form at the end of the training course. The form included demographic information such as participants' position, employment status (i.e., active duty or civilian), and experience level. Participants were then asked to rate the various pieces of the course and the trainer toolkit, using a four-point scale, with anchors ranging from "not helpful at all" (1) to "very helpful" (4). They also rated the effectiveness of the instructors and gave an overall course rating, using a three-point scale, with anchors ranging from "marginally effective" (1) to "very effective" (3). In addition, they were asked to rate their self-efficacy at teaching and applying MTM principles in their respective medical facilities using a four-point scale, with anchors ranging from "very uncomfortable" (1) to "very comfortable" (4). Finally, they were asked to identify the one thing that was most helpful and the one thing that was least helpful in preparing for the course.

Findings. Level I data. Overall, the MTM course was well received. Participant reactions indicated that it was well organized and contained appropriate content. Many attendees exuded confidence from the training course; they felt confident that they understood the material and could perform the teamwork tasks and apply them to their jobs (see Table 6). The course met their expectations because it clearly presented teamwork information and the goals of the program. In addition, it gave attendees skills to use to help improve teamwork in their departments.

Attendees were also pleased with the sequence of the course. They were particularly pleased that the material was presented and then followed by examples and/or videos to support it. The videos, vignettes, and case studies helped reinforce the material for the attendees. However, many of the videos and vignettes were examples of poor teamwork skills; attendees noted that examples of excellent teamwork skills should also be included. In fact, one attendee suggested having each facility participating in the training submit a teamwork success story ahead of time that could be discussed at the course in order to emphasize the results of effective teamwork. However, it could be difficult for attendees to pinpoint such examples.

Attendees felt that the three major strengths or best features of the course include the material, particularly the communication section, the videos, vignettes, and case studies, and the speakers. They also liked the audience participation and interaction both within the smaller groups and with the instructors. Other features that were named include the templates in the manual and the online portion of the course, where students are able to go through some of the material at their own pace before they attend the course. Unfortunately, the online training aid is not currently available. Several attendees would like to have the online section available as both a preview of the information for those who will be attending the class and also as refresher training for those who have already taken the course.

Table 6. Posttraining opinions about MTM

	Total (n=26)				
Item	Mean	Std. Dev.	Agreement	Neutral	Disagreement
The training was well organized.	4.6	.49	100%	-	-

I am confident that I understood the training content.	4.5	.59	96%	4%	-
I am confident that I can perform the tasks that were trained.	4.2	.72	92%	4%	4%
I am confident that I can use the knowledge that I learned on the job.	4.3	.80	88%	8%	4%
As a result of this training, I feel more confident about my ability to work effectively in a team.	4.2	.65	88%	12%	-
The training content was appropriate for my department.	4.2	.75	88%	8%	4%
Training will help my department improve patient safety.	4.1	.60	88%	12%	-
Training was an effective use of my time.	4.1	.70	88%	8%	4%
Training prepared me to work effectively in my job.	4.0	.71	76%	24%	-

Nearly all attendees would recommend the course to their fellow co-workers, because they felt that everyone could benefit from teamwork training. In addition, the course emphasizes critical skills that are vital for safe and effective patient care. However, two-thirds of attendees would change the course if they were to re-design it. The most popular suggestions include adding more case studies, scenarios, and videos as examples of both poor and effective teamwork and deleting the aviation CRM videos. Several attendees felt the aviation videos were difficult to understand and felt that explaining how CRM in aviation relates to medical team training was sufficient. A few attendees felt that the course was too long and there was too much time devoted to lecture. Attendees also felt they needed more answers to difficult questions and resistance they may face with leadership upon their return from the course and attempts at implementation. A final suggestion made was to change the case study template to ensure that it matches the order in which the foundational elements are presented in the manual.

The two biggest obstacles attendees named were getting buy-in from leadership and scheduling the training. The difficulty in convincing leadership stems from the challenge of showing them tangible values and benefits to the training, such as a decrease in the number of medical errors made or a large amount of money saved due to the training. With regards to scheduling, it is difficult to make arrangements for numerous people from the same department to attend an all-day course; it limits patients' access to health care. Also, deployments and assignment changes make it difficult to get everyone trained. A few people thought that the training should be mandatory to have a real effect on patient care.

Level II, III, and IV data. Unlike MedTeams™, we could not identify any additional data in the published literature on MTM describing its effectiveness beyond trainee reactions.

Strengths and Weaknesses

Strengths. To summarize, MTM offers a number of advantages. First, it uses a series of active learning techniques—including didactic lectures, behavioral modeling, and case studies—to develop trainees’ teamwork-related knowledge, skills, and attitudes. Second, it leverages known principles from human-factors research. For example, MTM training (a) explicitly distinguishes between destructive and constructive conflict resolution, (b) recognizes that the workload-performance relationship is curvilinear, and (c) distinguishes between authority (which is based on rank) and leadership (which is based on skills). Third, MTM training is interdisciplinary in nature, thereby teaching physicians, nurses, technicians and other key constituencies to work together. Finally, it provides a reference list that allows participants to continue refining their teamwork skills after they have completed the training.

Weaknesses. Nevertheless, like the other two programs, MTM has disadvantages. First, far more of the training time is devoted to providing factual information than to practicing actual skills with instructor feedback; the skills practice that is provided primarily involves low-fidelity techniques such as case studies. Second, although MTM provides trainees with a variety of “tools” to reinforce and sustain their teamwork skills, many of these aids are not tools in the strictest sense of the word. More often than not, the MTM materials consist of best practices or procedures (e.g., briefings, cross-checks), but not tangible tools (e.g., checklists, quick reference cards, etc.) that trainees can physically take with them. Third, even though MTM is based on the “train-the-trainer” paradigm, it does not appear to include mechanisms for preventing performance degradation among trainers. Finally, there does not appear to be a formal recurrency module for ensuring the maintenance of trained knowledge and skills.

Summary

In conclusion, attendees enjoyed the MTM course. It made them more aware of teamwork issues and taught them valuable skills. The most common suggestion for improvement that attendees made was to include more vignettes and case studies and even cut down the lecture if necessary. Finally, participants also highlighted the importance of U.S. Air Force leadership support to ensure that MTM is successful.

Chapter 4. Case Study 3—Dynamic Outcomes Management[©] ^{##}

Introduction

The primary purpose of DOM—renamed LifeWings[™] subsequent to our study—is to increase patient safety, reduce medical errors, and improve the quality of health care.³⁶ DOM achieves this by improving trainees’ skills in team-building, recognizing adverse situations, counteracting the effects of stress and fatigue, communicating, and decision-making.³⁷ DOM provides interdisciplinary team training to surgeons, nurses, and anesthesiologists. The program draws heavily on Crew Resource Management (CRM) training from aviation²⁰, and was developed by Crew Training International (CTI), which offers specialized training programs for aviation, construction, general business practice, and the medical industry.

Case Study Approach

For DOM, we were able to access several sources of information. Specifically, we reviewed all instructional materials for the course that was observed. Relevant research studies that have been published on the effectiveness of DOM training were also reviewed. In addition to our document review, we observed two administrations of the course at a regional university medical center and collected pretraining data on student experiences and expectations and posttraining data on student reactions to DOM. Each of these activities is briefly described in more detail below.

Document and Literature Review

Our document review identified one article that has been published on the DOM approach. This paper was published by Rivers and colleagues²⁰ and describes an evaluation of the effectiveness of this training. Results of this paper are described when we review the additional evidence that supports DOM.

In addition to reviewing the literature, we carefully reviewed the Student Guides from the regional university medical center course. CTI staff provided these guides to us when we attended and observed the training.

Course Observations

AIR staff observed the two sessions of DOM training that were administered to hospital staff at a regional university medical center in September. Attendees were largely from trauma, emergency room, and cardio-thoracic medical areas. Over three-fourths of the attendees were nurses in addition to a few physicians, scrub technicians, paramedics, and receptionists. The same two CTI staff members taught the course each day. Instructors were retired Navy pilots who had also flown commercial aircraft. Observations were made of the classroom portion of this training, which lasted 8 hours each day.

Pre- and Posttraining Assessment Tools

In addition to observing the classes, AIR staff administered pre- and posttraining assessments to all DOM participants. The pretraining tool was designed to assess student experiences and

^{##} Note: Appendixes cited in this report are provided electronically at <http://www.ahrq.gov/qual/teamtrain/index.html#app>.

gauge participant attitudes and beliefs about teamwork. The results from this measure were described in an earlier section of this report entitled, “Description of Participants.” The posttraining tool measured participant utility reactions to DOM training.

Instructor Interviews

Unlike MedTeams™ and MTM, DOM instructors were not interviewed. This was primarily a function of the fact that DOM does not use a train-the-trainer technique. All DOM instructors are CTI employees. Therefore, many of our interview questions regarding instructor selection and training were irrelevant. However, although no formal interviews were conducted, we did have informal discussions with representatives from CTI about various aspects of the course.

Below, we present the results from our analysis of this information. These results are organized around the same set of variables that we used to assess MedTeams™ and MTM. For each variable we provide descriptive data from our literature review and then findings from our observations, and data collection, when appropriate. Table 4 (p. 18-19) provides a summary of this information for DOM.

Results

Theoretical Basis

The core objectives, curriculum, and instructional strategies for DOM were derived from CRM training programs that CTI has developed for the U.S. Air Force, U.S. Navy, as well as a number of other commercial airlines and military clients. The CTI developers believe that there are a number of aviation safety practices that can be applied directly to health care. Prior to conducting the course, DOM staff spends several days at the hospital site observing and conducting informal interviews with staff. Information gained from these activities is used to customize the DOM training materials to the particular institution in which the training will be administered.

Analysis of Training Needs

We were unable to identify any documentation that described how DOM was developed. Other than its basis in CRM and the fact that DOM developers spend time at the institution in which the training will be implemented, we could find no evidence of any other needs analysis activities (e.g., closed case reviews, critical incident study, etc.). We suspect that much of this training was derived from existing course materials that CTI uses to conduct CRM training for the military and commercial airlines. A review of these materials demonstrates its strong basis in aviation. However, we have no evidence to confirm or disconfirm this hypothesis.

Training Objectives

The primary objective of DOM is to teach aviation safety practices to health care workers. The DOM developers believe that there are many parallels between these industries that make CRM training relevant. These include stress, the need for highly functioning teams, the importance of accurate and precise communications, and the high cost associated with systems failures.²⁰

Training Content

DOM consists of seven modules that are taught using an 8-hour lecture, discussion, and small group activity format. They are:

1. Introduction
2. Managing Fatigue
3. Creating a Team
4. Recognizing Adverse Situations
5. Cross-Check and Communication
6. Decisionmaking
7. Performance Feedback

The “Introduction” module is a relatively short module that introduces the participants to DOM training, CRM, and the idea of aviation safety practices and their application to health care. The core skills that are the target of DOM training are also introduced. These include team management, recognizing adverse events, communication, decisionmaking, and performance feedback. Module 2 covers “Managing Fatigue.” Here, participants learn to recognize how fatigue can affect their performance and specific countermeasures for managing the negative effects of fatigue. Module 3 covers the topic of “Creating a Team.” Here, the benefits of teamwork are presented and discussed. In addition, participants engage in a small group activity in which they compile lists of things that team leaders and team members should and should not do. Module 4 focuses on “Recognizing Adverse Situations.” Here, the notion of red flags is described, and participants learn what they should do when they observe a red flag (i.e., see it, say it, fix it). Several case studies are then reviewed as a group. Each case study involves identifying red flags and solutions to these potential problems. Module 5 focuses on “Cross-checking and Communication.” Here, the steps in the communication process are presented as well as the four parts of an assertive statement. Again, participants are given an opportunity to apply the information presented during a case study exercise at the end of the module. Module 6 covers “Decisionmaking.” Here, the different types of team decisions are described, as is the concept of building a shared mental model. Participants then apply these concepts during an in-class role-playing exercise. Finally, Module 7 focuses on “Performance Feedback.” Here, specific strategies are provided regarding how to debrief an individual’s or team’s performance as well as request feedback from a teammate.

Instructor Selection, Training, and Preparation

As mentioned previously, unlike MedTeamsTM and MTM, which employ a train-the-trainer format, CTI staff conducts DOM training. The two instructors who conducted the course were both retired Navy fighter pilots and also had worked for commercial air carriers. We did not ask these individuals how they were trained or how much preparation was involved, but we observed high reliability in how the training was conducted. In our opinion, CTI instructors were extremely professional, well trained, and highly engaging.

Instructional Strategies

Description. DOM purports to employ a variety of training methods that address two of the three recommended phases of CRM training: Awareness and Practice-and-Feedback. The Continual Reinforcement phase is not addressed.

The awareness phase includes 8 hours of classroom instruction. Once the classroom-training portion of the course is complete, CTI staff work with hospital personnel to develop checklists and other tools that can be used to promote safety at the hospital (the Practice-and-Feedback

phase). One of the CTI trainers reviewed the basic materials with us and showed us examples that had been developed for other clients. However, we never received any copies of this information for a more in-depth review.

Below, we describe our findings from reviewing the classroom component of DOM—Awareness Training. Although we would have liked to observe the actual applications of the posttraining tools and checklists, this was not possible because of time constraints.

Findings. We observed two complete classes. Both classes started at 8 o'clock in the morning and concluded by 4 o'clock in the afternoon. Classes were kicked off by the Associate Dean for Clinical Affairs, who emphasized the university health center's goal of becoming the Nation's safest hospital. The same two CTI instructors then conducted the training. Instructors were consistent in their presentation of the materials across the two sessions. Effective use was made of the videotapes demonstrations, in-class exercises, and cases studies, which were designed to support the lecture portion of the training.

Similar to MedTeamsTM and MTM, we asked students to indicate the extent to which they agreed with the statement, "The training was well organized." Overwhelmingly, students agreed or strongly agreed with this statement (see Table 7). The vast majority of students also reported that the training content was appropriate for their department.

Training Effectiveness

Description. For the classroom-based phase, DOM relies upon the collection of trainee reactions (Kirkpatrick's Level I data) and a Human Factors Attitude Survey to determine training effectiveness. Regarding the reaction measure, participants were asked to rate how useful each DOM training module was. In addition, participants were asked to assess the quality of the instruction provided by each instructor. Regarding the Human Factors Attitude Survey, participants were asked to complete this survey twice, once prior to training and once after training. This measure appears to be modeled on the Cockpit Management Attitude questionnaire developed by Helmreich and colleagues,²¹ though we received no direct information on the measure's development, its subscales, or its psychometric qualities. However, CTI did not withhold this information from us; we merely did not request it because we viewed a psychometric analysis of this tool as beyond the scope of the evaluation.

Findings. Similar to our investigation of MedTeamsTM and MTM, we collected additional, independent data on trainee reactions to the course. Utility reaction data¹³ were collected from participants. In addition, we reviewed existing empirical literature that has been reported regarding Kirkpatrick's Level II (Knowledge), Level III (Behavior), and Level IV (Results). We reviewed an evaluation of the implementation of DOM that showed that the trainees developed positive attitudes toward the importance of teamwork, rated the training as useful, and demonstrated a 50 percent reduction in surgical count errors.²⁰ Below, we describe our findings from these activities.

Level I Data. Attendees of the DOM courses had positive reactions to the course. Not only did they like the content and understand it clearly (98 percent agreement), they also felt that the training course was useful. Almost all (96 percent) felt that they could use the knowledge they learned on the job and perform the tasks learned (95 percent). Because of the training, they also felt more confident about their ability to work effectively in a team (92 percent) (see Table 7). Finally, the course met most attendees' expectations (98 percent), mainly because of the

informative content and the skills (e.g., working effectively as a team and communication) that were taught.

When asked if they would make any changes to the course, the majority of attendees would not change anything about the course. Other attendees would like to include more area-specific scenarios and practical applications, such as role-plays, and more information on assertiveness advice and effective communication skills at different levels (e.g., RN, MD, etc.). A few attendees would like to see a more diverse group of students. For example, they would like to see technicians, nurses, nurse practitioners, and physicians from different areas mixed better at the different tables. In addition, a few attendees would like to have a re-evaluation done in the future to learn if the principles taught have been integrated and to see changes in best practices at other institution following the course.

Finally, consistent with their positive impressions of the course, almost all attendees (98 percent) would recommend the course to coworkers. The main reason that they would recommend the course focused on the team building content of the course, including the communication portion, which can help make individuals and teams be more effective in their jobs and improve patient care. In addition, participants highlighted the ability of DOM to change peoples' mindsets. They also pointed out that participants should be able to integrate the skills that were learned into their jobs.

Level II, III, and IV data. Data concerning the development and evaluation of DOM beyond trainee reactions are limited. As of January 2003, over 160 surgical staff members at Methodist University Hospital in Memphis, TN, had completed DOM training. An evaluation of DOM at Methodist Hospital found improvements in participants' attitudes toward the importance of teamwork issues in the OR, favorable reactions concerning the usefulness of DOM training, and a 50 percent reduction in the number of surgical count errors. However, the small sample size makes it difficult to assess the generalizability of the results. Moreover, the lack of control groups makes it difficult to determine whether the training caused these improved outcomes.

Table 7. Posttraining opinions about Dynamic Outcomes Management®.

	Total (n=78)				
<i>Item</i>	Mean	Std. Dev.	Agreement	Neutral	Disagreement
I am confident that I understood the training content.	4.6	.65	98%	1%	1%
The training was well organized.	4.7	.72	97%	-	3%

	Total (n=78)				
<i>Item</i>	Mean	Std. Dev.	Agreement	Neutral	Disagreement
I am confident that I can use the knowledge that I learned on the job.	4.6	.68	96%	3%	1%
I am confident that I can perform the tasks that were trained.	4.4	.70	95%	4%	1%
As a result of this training, I feel more confident about my ability to work effectively in a team.	4.5	.73	92%	7%	1%
The training content was appropriate for my department.	4.4	.83	91%	6%	3%
Training prepared me to work effectively in my job.	4.4	.78	88%	11%	1%
Training was an effective use of my time.	4.4	.86	88%	9%	3%
Training will help my department improve patient safety.	4.4	.83	87%	10%	3%

Strengths and Weaknesses

Strengths. Our review of the literature, observations of the classroom phase, and post training assessment suggest that participants had positive reactions to this training. Participants indicated that the training was well organized, and they felt that they could use many of the strategies discussed during training upon returning to their jobs. Second, DOM instructors were extremely professional and conducted high-quality training. Although not necessarily the most practical approach to implementing training throughout a large-scale organization like the DoD, using professional instructors from the course vendor resulted in significantly better and consistent instruction. Third, DOM staff relayed to us that there was no delay (like MedTeamsTM) between the classroom phase of DOM and when the safety tools are implemented. Therefore, skill decay is less likely with this program. Finally, the DOM developers are beginning to make efforts to collect additional data on DOM effectiveness beyond trainee reactions. Pre- and posttraining attitude data are currently being collected and discussions with the developer indicated that future studies are planned to examine DOM effectiveness. The results from the Methodist Hospital Investigation, which showed a reduction in sponge count errors, are encouraging.

Weaknesses. Nevertheless, DOM, like the other programs, does have its limitations. First, we could uncover no evidence that the results of an in-depth pretraining needs analysis drove the development of DOM. It is our impression that the course developer extracted this information from CRM training and subject matter experts customized the materials to health care. CTI staff

then visit the hospital in which training will be implemented to make any additional modifications to the courseware that is required. Second, like MedTeamsTM and MTM, a primary objective of DOM training is to develop team skills. However, most of the classroom instruction focused on mastering declarative and some procedural knowledge. There wasn't much time devoted to skills practice. Third, DOM did not employ a cultural assessment/evaluation component prior to implementing the training. As a result, it is entirely possible that DOM is effective only in hospitals that have already made a commitment to patient safety. The kickoff by the Associate Dean emphasized the medical center's commitment to DOM and patient safety. Also, the pretraining data suggested that the organization has a culture that supports teamwork. Finally, although we did not specifically collect this data, the costs of implementing DOM are likely to be higher than MedTeamsTM and MTM. This is primarily a function of the fact that CTI relies on its own cadre of instructors to conduct training and a full array of consultative services. While this produces reliable, high-quality instructors, we question the viability of such a strategy when training must be delivered in a timely fashion to multiple hospitals.

Summary

In conclusion, the DOM course was extremely well received. There was great support for DOM training and a strong commitment to patient safety by that organization. The content covered important aspects of teamwork and presented similar strategies to those discussed during MedTeamsTM and MTM training. In our opinion, the quality of instruction was perhaps the best of the three programs we reviewed; however, there are many practical limitations with using vendor instructors when introducing medical team training in the DoD. Finally, we could not uncover much information about how the DOM course was developed, which caused us some concern. There was no evidence to suggest that DOM was in fact targeting the right skills for development or that the training objectives were appropriate.

Chapter 5. Discussion^{§§}

Introduction

In this section, we summarize the results from our case study analysis of DoD-sponsored medical team training programs. As noted earlier, our primary goal throughout this project was to provide an independent and object assessment of MedTeamsTM, MTM, and DOM (now called LifeWingsTM), based on the information we had access to. Because the vast majority of this information was qualitative in nature, we have purposely refrained from making comparative judgments among the three training programs. From time to time, we have pointed out strengths and weaknesses based on the information we collected. This was done to provide the DoD with as much information as possible. However, most of the programs' differences were minor in nature and overall we felt that these programs were fairly equivalent for addressing the awareness phase of training. Therefore, the conclusions and recommendations that follow apply equally to MedTeamsTM, MTM, and DOM.

Summary

Are the Medical Treatment Facilities Ready for Training?

The success of any training intervention depends not only on the training content and instructional techniques, but also on how the intervention is positioned, supported, and reinforced by the organization.³⁸ In particular, congruence between the objectives of training and the organization's safety culture is critical to ensuring the transfer of trained behaviors. A safety culture is defined as a shared belief about the importance of safety, which leads to specific safety norms that dictate behavior within the group. Previous research by Helmreich and colleagues^{39,40} has demonstrated the importance of a positive safety culture in both aviation and health care.

Despite the fact that publicly-available instruments have been developed for assessing the safety culture of health care organizations,^{39***} we were unable to locate any evidence that MedTeamsTM, MTM, or DOM conducted a pretraining safety culture assessment. As a result, it is entirely possible that CRM-derived team training programs only work in medical facilities that have already made a commitment to teamwork, secured upper-level management support, and recognized the need for change. Therefore, we recommend that future patient safety initiatives, whether it's a training intervention or otherwise, always conduct a thorough pretraining safety culture analysis to identify barriers that can mitigate the transfer of trained skills.

Is Aviation Crew Resource Management the Right Starting Point for Medical Team Training?

Several researchers have recently suggested that health care providers look to CRM in aviation as a model for reducing medical errors.^{1,41-44} The argument for adopting CRM training is based on several important similarities between medicine and aviation. For example, both domains require multidisciplinary teams of highly-trained professionals to perform complex and dynamic tasks; both are conducted in high risk environments where the consequences of error

^{§§} Note: Appendixes cited in this report are provided electronically at <http://www.ahrq.gov/qual/teamtrain/index.html#app>.

[†] The AHRQ Hospital Survey of Patient Safety Culture (<http://www.ahrq.gov/qual/hospculture/>) was released in September 2004, after the work on this study was completed, and thus is not included in the references.

can be deadly; and both require the team members to make decisions based on limited information under conditions of high stress, high workload, and time pressure. Moreover, recent research by Helmreich and colleagues⁴⁰ has shown that pilots and health care professionals exhibit similar attitudes, such as the mistaken perception of invulnerability to the effects of stress and fatigue. Given these similarities, it is not surprising that all three programs are based on the aviation CRM model. Specifically, MedTeamsTM is based on the U.S. Army's CRM training course for helicopter crews;^{26,45} Medical Team Management (MTM) is based on the U.S. Air Force's CRM training program for aviators;⁸ and Dynamic Outcomes Management[®] (DOM)/LifeWingsTM is based on military CRM training for fighter and cargo pilots.²⁰

Despite these similarities, there are a number of important differences between aviation and medicine. For example, the size and composition of teams varies greatly between the two domains. Whereas commercial flight crews include 2-3 pilots whose performance is largely dictated by standard operating procedures, medical teams include up to 15 physicians, assistants, nurses, technicians, and staff from other disciplines whose performance is less amenable to standardization.⁴⁶ In addition, because of their repetitive and highly scheduled nature, flight operations are well-suited to certain CRM tools such as prebriefings/debriefings, checklists, and quick reference cards.⁴⁷ By way of comparison, certain medical operations—such as emergency medicine—typically cannot be planned in advance. This may make them ill-suited to interventions which require such strict, scheduled, and orderly procedures.

In addition to these differences, it is important to note that CRM is not a universal remedy. CRM by itself will not eliminate all the systematic contributors to medical error. Rather CRM is one component of a comprehensive approach to improving patient safety. For example, in AHRQ's Evidence-based Practice Report (Number 43), *Making Health Care Safer: A Critical Analysis of Patient Safety Practice*,⁴⁸ 50 safe patient practices or areas for system improvements were identified, one of which was CRM. Furthermore, this report noted that the evidence base for CRM's effectiveness was viewed as low relative to others, but the report also suggests further research on the introduction of CRM in health care is likely to be beneficial.

The differences between aviation and health, as well as the limited evidence base, do not negate the potential value of introducing CRM training in medicine. Rather, they highlight the importance of carefully tailoring CRM principles and practices from aviation to medicine⁴⁶ and the need for future empirical investigations that demonstrate CRM's effectiveness. This tailoring should be driven by the results of a thorough needs analysis.

Have the Needs Analyses Gone Deep Enough?

All training programs should begin with a comprehensive needs analysis. At a minimum, this should include an organizational analysis (to identify the organization's readiness for change), a personnel analysis (to identify the workforce's specific knowledge, skill, or attitude deficiencies), and a task analysis (to develop and sequence the learning objectives).^{49,50}

Presently, at least two of the three major team training programs—MTM and MedTeamsTM—began with at least a partial needs analysis. For example, MTM was developed as a result of ineffective teamwork and communication as a recurrent theme in major medical events. A subsequent validation of the need occurred with a review of 60 critical incidents, which revealed communication problems were the single largest contributing cause of medical errors. Similarly, MedTeamsTM began by a systematic review of closed case records, which was scored using a teamwork failure checklist to identify trends.⁷ However, subsequent versions of MedTeamsTM have involved customizing the original ED curriculum to L&D and the OR by

adapting the case studies and examples to the clinical context with the aid of subject matter specialists. MTM has not engaged in such customization and has advocated a one-size-fits-all approach. DOM has employed a similar approach to MedTeamsTM.

We question whether or not the MedTeamsTM and DOM strategy will adequately address the unique team requirements of different medical services. Our expert panel suggested that variation is likely so we recommend additional, deeper-level analyses when customizing medical team training to a specific specialty area. Alternatively, we see some merit in the MTM approach, if a generic set of skills exists that cuts across all medical specialties. However, these skills and the behaviors they represent would have to be established and agreed upon.

Are the Current Instructional Strategies Appropriate?

Despite improvements in training technology, our case study analysis found that all three programs rely almost exclusively on classroom-based instructional techniques—such as didactic lectures, case studies, videotaped vignettes, and pretraining readings—to deliver their course-specific content. For example, MedTeamsTM includes an 8-hour block of classroom instruction that contains an introduction module, five learning modules, and an integration unit. Supplementary materials include a 30-minute video that depicts examples of good and bad performance. After completing the classroom training, each team member participates in a 4-hour practicum that involves practicing teamwork behaviors and receiving feedback from a trained instructor. Coaching, mentoring, and review sessions are also provided during regular work shifts.⁷ Similar instructional strategies are currently used by MTM and DOM. Our review of the published literature suggests that these strategies are best suited to developing factual or declarative knowledge of CRM principles,⁵¹ such as that which occurs during awareness training.

To date, none of the programs use simulators, such as the type used in Anesthesia Crisis Resource Management⁶ to provide trainees with the opportunity for skills practice with instructor feedback, as recommended in aviation CRM.^{5,52} Although both classroom-based and simulation-based strategies are justifiable vehicles for delivering the training content, the sense that we gained from our review was that classroom-based techniques are used primarily because they have always been used in the past, not because they are particularly well-suited to specific teamwork-related competencies. Therefore, we recommend that future research in MTT address which instructional strategies are most appropriate for which type of competencies, and then tailor the training such that the instructional strategies are chosen to specifically complement the training content.

Are the Current Methods for Delivering Classroom Training Sufficient?

Each program has two primary instructional components: a classroom-based (i.e., implementation) component and post-classroom (i.e., sustainment) component. In this section, we address the classroom-based component. Our document review revealed that both MedTeamsTM and MTM use a “train-the-trainer” paradigm, whereby individuals from the medical treatment facilities receive instruction in teamwork skills, and then return to their respective organizations to train the rest of their colleagues. However, our review also suggested that MedTeamsTM and MTM have few formal mechanisms for ensuring consistency and preventing performance degradation among instructors once they return to their respective facilities. To some extent, this issue is not relevant for DOM, because a small cadre of trainers from Crew Training International (CTI) conducts all the training.

For example, upon successfully completing the train-the-trainer course, MedTeams™ instructors are then “certified” by Dynamics Research Corporation. Unfortunately, there is little publicly available information about this certification process. For example, it is unclear whether the certification is based on the instructors’ knowledge of teamwork principles, their actual level of teamwork skills (e.g., communication, decision-making, etc.), their ability to teach teamwork-related issues to others, or some combination of these factors. MTM has even less stringent procedures for ensuring consistency and preventing performance degradation. It is requested (but not required) that potential MTM instructors have at least 5 years of clinical experience in their specialty areas, at least 1 year of time remaining in the Air Force, that they be competent speakers, and that they have previous experience delivering training.

The presence of formal procedures for ensuring consistency during the implementation phase is essential to the success of any training program. However, our observations and interviews suggest that the implementation of MTT programs may not always correspond to their developers’ specifications. For example, our observation of the MedTeams™ course showed that the classroom portion of training varied from instructor to instructor, with some courses lasting only 3 hours. We discovered similar results while interviewing MTM instructors.

To some extent, this is to be expected with the train-the-trainer paradigm. Specifically, the train-the-trainer paradigm is designed to be a cost-effective means for distributing training to a large number of people within a short period of time. However, the trade-off is that the training developers have less control over how the training is actually implemented at the host sites. DOM has taken an alternate approach. By using a small cadre of trainers from Crew Training International, they can reach a much smaller audience; however, this provides them with greater control over the quality of instruction. Because our observations and interviews were based on a small, nonrepresentative sample, it is impossible to estimate the actual base rate of instructor deviations from the prescribed training syllabi. Nevertheless, we caution MTT developers to carefully and periodically monitor the implementation of their respective MTT programs to ensure that the training is delivered as designed.

Are the Current Methods of Sustainment Sufficient?

In this section, we address the post-classroom component of training. Our document review revealed that all three programs have some form of post-classroom follow-up. During this time, trainees are provided with the opportunity to practice their trained skills, and to receive some degree of feedback from their site coordinator.

For example, the post-classroom component of MedTeams™ lasts for approximately 6 months. During this time, trainees are encouraged to practice their newly-trained skills. According to our document review, MedTeams™ employs a number of tools for sustaining effective team performance, such as trainees’ monitoring one another’s performance. In addition, routine team meetings are conducted to ensure team members’ continued focus; status boards are used to maintain team members’ situational awareness about particular patients, nurses routinely participate in morbidity and mortality (M&M) meetings, and performance evaluations directly consider teamwork issues.⁵³ MTM includes similar techniques for sustaining and reinforcing teamwork-related issues in the post-classroom environment, such as periodic (scripted) safety drills, periodic team leader meetings, formal recognition of improved/effective teamwork during the trainees’ annual performance reviews, and a report on implementation progress to the Air Force Patient Safety office.³³ DOM also includes such practice with the customized development of checklists and other tools that support safety practices.

Previous research suggests that the presence of formal procedures for sustaining trained behaviors in the posttraining environment is essential for ensuring the success of training.⁵¹ However, our review suggests that the respective course developers spent considerably more time focused on the short, classroom-based component of training (which typically last between 8-12 hours) than on the extensive, post-classroom component (which can last up to 6 months). This is ironic, given that the classroom phase was focused largely on the awareness of teamwork-related issues. For each program, the classroom component covered teamwork-related knowledge and attitudes; there was substantially less opportunity for actual skills practice with instructor feedback. Therefore, we urge MTT developers to pay greater attention to the post-classroom component of training, because this is where the real changes in learning (i.e., development of teamwork-related skills), performance (i.e., greater use of checklists, pre-briefings, cross-checking, etc.) and results (i.e., reductions in medical errors) are likely to occur.

Recommendations

In this section, we provide theory- and practice-based recommendations for improving medical team training. The overarching theme in this section is the need for a more thorough understanding of the medical team performance and medical team training domains than currently exists.

Standardize the Knowledge, Skills, and Attitudes

A recent review by Cannon-Bowers and colleagues⁵⁴ has noted that the team skills literature is confusing, contradictory, and plagued with inconsistent labels and definitions. In some cases, different labels are often used to describe the same teamwork competencies; in other cases, the same labels are used to describe different competencies. Thus, our first recommendation is to develop a standard nomenclature that names and defines the core teamwork-related knowledge, skills, and attitude competencies for successful teamwork in health care.

We envision this first taxonomy as all-inclusive, in the sense that it would incorporate the core competencies that potentially influence all types of medical teams, regardless of specialty or context. In other words, the proposed taxonomy would be medical-team generic. This medical-team generic specification connotes two theory-driven steps: determining an appropriate level of explanation for identifying core teamwork competencies and determining which of these competencies are relevant to medical teams.

The first step, determining an appropriate level of explanation, is necessary to ensure that the constructs included in the taxonomy are conceptualized broadly enough to span the entire health care field, yet specific enough to facilitate valid measurement. Further, although this list of core competencies should reflect all relevant aspects of team performance, it must be concise enough to generate teamwork and team training research and to facilitate team training needs analyses in organizations.

The second step, determining relevant core competencies, encompasses two activities. One is to establish which of the many competencies manifested in previous research are relevant to virtually all medical teams; a second, and perhaps more demanding task is to identify core medical-team competencies that have not emerged from team research in other domains. For guidance in this area, researchers might rely, to some extent, upon medical experts like those engaged in the panel that AIR held in January 2003 (refer to Appendix D for a list of panel participants).

However, we believe that, along with developing a theory of medical team performance, standard job-analytic techniques, such as task questionnaires, structured interviews, and non-obtrusive observations will yield the most valid information. Moreover, we emphasize the importance of large-scale, stratified data collections because the goal is to identify generic competency requirements with which the medical community at large concurs.

Identify Practice-Specific Training Requirements

We believe that the medical-team generic taxonomy described above would be useful to both theoretical and applied research; nevertheless, we believe that no single set of team knowledge and skills can be applied equally across all medical practices and contexts. For purposes of this discussion, we define a “practice” as a medical specialty or subspecialty, such as emergency medicine, general or family medicine, intensive care, surgical medicine, obstetrics, and so forth. Medical practices differ dramatically across a variety of criteria, including team size, lifespan, acuteness (i.e., consequence of error), and member composition, to name but a few. As an example, emergency medicine providers function in hospital emergency departments, in emergency-response mobile units, and on battlefields. Similarly, urban and rural general practitioners operate in independent or multipractitioner offices, as well as in community walk-in clinics. Neither the competencies that impel successful teamwork nor an optimal team training strategy can be expected to generalize across these diverse contexts. And, of course, not all members within the same team will necessarily need the same knowledge, skills, and attitudes.

Thus, our second recommendation is to identify practice-specific training requirements for diverse health care contexts. These taxonomies would not be redundant with the generic taxonomy. Rather, a practice-specific taxonomy would reflect “core” competencies in the sense of denoting the knowledge, skill, and attitude requirements that are central to teamwork in a given practice. The medical content and procedures that define that practice would drive the identification of relevant team-competency requirements.

Virtually no previous research has addressed the manner in which differences within and between medical practices should be reflected in practice-specific taxonomies. Yet we find this issue sufficiently compelling to warrant further investigation. Because these taxonomies are derived from the medical characteristics of specific practices (and the contexts within them), subject-matter experts who represent each practice might be invaluable in identifying practice-specific team competencies that are not redundant with the generic taxonomy. Nevertheless, we would also suggest that researchers avail themselves of job analysis questionnaires, structured interviews, and nonobtrusive observations.

Leverage Existing Knowledge About Teamwork Training

Although the field of medical team training is still in its infancy, the science and practice of team training is far from new. Research on the design, implementation, and evaluation of team training programs began nearly 50 years ago. Since that time, a substantial body of research has been conducted regarding the most effective strategies and techniques for training teamwork-related knowledge, skills, and attitudes. For example, Salas and his colleagues have compiled an extensive collection of principles and guidelines for assertiveness training,⁵⁵ cross-training,⁵⁶ stress management training,⁵⁷ and team self-correction.⁵⁸

Unfortunately, the existing medical team training programs do not appear to have leveraged this body of research. For example, as noted earlier, the MTT programs that we reviewed rely almost exclusively on classroom-based training methods, rather than choosing from a variety of

instructional strategies to complement the specific training content. With few exceptions, new advances in training technology—such as computer-based training, low-fidelity simulations, embedded training, and scenario-based training—have rarely been used, despite growing evidence regarding their effectiveness.⁵¹ Recent advances in training theory—such as the effect of pre- and posttraining factors on training outcomes, the effect of practice schedules on skill acquisition and retention, and the critical role of individual differences in shaping trainees' motivation—have similarly been ignored.^{51,59-61} Each of these factors has been shown to improve the effectiveness of team training programs. Thus, our third recommendation is that instructional designers leverage such information in their own medical team training programs.

Develop a Standardized Training Specification

Two different MTT programs are currently sponsored within the DoD: MedTeamsTM and MTM (DOM is not funded by the DoD but has been implemented at one naval medical hospital). As we have shown in previous sections, these programs use similar instructional strategies, have similar training content, and have demonstrated similar results concerning their effectiveness. These similarities beg the question: Why have three separate MTT programs? Despite outward appearances, this is not a trivial question. Practically speaking, multiple training programs could be problematic, especially during deployment when intact teams are split up. For example, a deployed team may consist of some individuals who have received MTT and some who have not. Alternatively, a deployed team may include staff from multiple branches of the armed forces, each of which may use a different MTT program. This could create a great deal of confusion, for example if the team members were practicing similar teamwork behaviors, but calling them by different names or using different approaches to accomplish the same task.

Standardizing MTT would produce greater consistency in the design, delivery, and evaluation. Thus, our fourth recommendation is that the DoD develops a training specification for MTT programs in specific practice areas. In addition to describing the core teamwork competencies for each practice area, the specification would outline the appropriate instructional strategies for each core competency, the appropriate sequencing of training activities, and outcome measures for assessing the degree of skill acquisition, to name but a few. Moreover, such a training specification would allow the DoD substantial flexibility in procuring and administering the training. For example, training could be administered internally or with the aid of contractors, depending on time and resource constraints. Regardless of who offers the training, the content and delivery would be essentially standardized by the program specification.

Develop Technical Assistance on Crew Resource Management Issues in Health Care

The Federal Aviation Administration (FAA) promotes aviation safety by two primary mechanisms: education and enforcement. Of the two, education is the most proactive way to prevent problems from occurring. One of the FAA's primary means of educating the aviation community on important initiatives is through the use of advisory circulars (ACs). In general, ACs present guidelines for developing, implementing, and evaluating various FAA initiatives such as pilot Crew Resource Management (CRM) and simulation-based training programs.^{5,62}

Advisory circulars are designed to be informative. They typically present one or more ways—but not the only way—of addressing a particular issue. For example, the FAA's advisory circular on CRM training includes a definition of CRM concepts, fundamentals of CRM training implementation, suggested curriculum topics, guidelines for assessing the effectiveness of CRM

training, example behavioral markers for specific CRM skills, and suggestions for further reading.

Under the Patient Safety and Quality Improvement Act of 2005 (P.L. 109-41), the Agency for Healthcare Research and Quality (AHRQ) has been charged by the Secretary of HHS with—among other things—providing technical assistance to the newly created Patient Safety Organizations (PSOs) that will support providers in the “improvement of patient safety and reduce the incidence of events that adversely effect patient safety.” We recommend that the Agency prepare technical assistance documents comparable to the FAA Advisory Circulars to help the PSOs guide providers on issues related to team training and error prevention. We believe that human factors-related technical assistance to the PSOs would go a long way to educate the medical community about the importance of MTT for ensuring patient safety, and for ensuring consistency across MTT programs.

Conclusions

In conclusion this report presents an in-depth case study analysis of three medical team training programs, MedTeams™, Medical Team Management, and Dynamic Outcomes Management®. This was the first independent assessment of these programs. The case study approach allowed us to collect detailed, comprehensive information on each program, which we reported along a common set of variables. Although this study was qualitative in nature, it is the first effort to capture that state-of-the art in medical team training.

AHRQ’s Evidence Report 43 (*Making Health Care Safer: A Critical Analysis of Patient Safety Practices*)⁴⁸ suggested that future research on medical team training is likely to be beneficial and have a significant impact on patient safety. We view the results presented in this investigation as a starting point for future studies on medical team training. Here, we have provided information on current objectives, strategies and successes of existing programs as well as where opportunities for improvements exist. We have also delineated several areas where future research is most warranted. However, empirically-based research will require a mandate from program sponsors, Federal agencies, or the health services research community; greater access to health care workers and patients to collect both process and outcome data; and significant resources in terms of time, money, and personnel. Nonetheless, we believe that such investments are worthwhile, because few would dispute the relation between team performance and safety. The challenge is to show irrefutable evidence that substantiates the relation between teamwork in health care and the desired outcome, a reduction in errors, because the medical error rate, although unacceptably high, has a relatively low base rate. We believe that this can be accomplished under the right conditions and point to the on-going L&D study as an example of the kind of investigations that are required.

In summary, we believe that the future is bright for medical team training because there is an existing knowledge base from aviation and other high-risk industries on which health care can gain traction. Great strides have been made with the introduction of the development and introduction of the three training programs described in this report. We view these programs as the first generation of what we believe will be continuous, sustained advancements in medical team training over the next decade and beyond.

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Appendix A. Pretraining Questionnaires

Medical Team Training Survey (MEDTEAMS™)

The purpose of this survey is to improve the effectiveness of DoD-sponsored medical team training (MTT) programs. The survey should take approximately 10 minutes of your time. Your name is not required. We appreciate your feedback!

Date _____ Time _____

Physician _____ Nurse _____ Corpsman _____ Other (please specify) _____

A. Please answer questions 1-5 based on your personal experiences. (Y/N)

- _____ 1. Have you ever worked in a medical team where you did not feel comfortable voicing your professional opinion?
- _____ 2. Have you ever worked in a medical team where there was no clearly designated leader?
- _____ 3. Have you ever felt pressured to perform a medical procedure that you felt uncomfortable doing?
- _____ 4. Have you ever witnessed an actual or potential mishap that could have been prevented if the team had learned from their previous mistakes?
- _____ 5. Have you ever witnessed a routine medical procedure that went wrong because the team did not adequately prepare beforehand?

B. Please rate questions 6-15 using the following 5-point scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

- _____ 6. The culture in our department makes it easy to learn from the mistakes of others.
- _____ 7. Our doctors, nurses, enlisted personnel, and other team members work together as a well-coordinated team.
- _____ 8. Disruptions in patient care (e.g., shift changes, patient transfers) can be detrimental to patient safety.
- _____ 9. Physicians, nurses, enlisted personnel, and other team members in this department know and understand each others' respective responsibilities.
- _____ 10. My department does a good job of training new personnel.
- _____ 11. Teamwork deserves more attention in health care.
- _____ 12. I am confident about my ability to work effectively in a team.
- _____ 13. Teamwork is one of the most important skills in the OR.
- _____ 14. People with strong teamwork skills are more likely to be successful in health care.
- _____ 15. It is impossible to function in health care without being a good team player.

Medical Team Training Survey (MTM)

The purpose of this survey is to improve the effectiveness of DoD-sponsored medical team training (MTT) programs. The survey should take approximately 10 minutes of your time. Your name is not required. We appreciate your feedback!

Physician _____ Nurse _____ Other (please specify) _____

What is your medical specialty? _____ At what base are you stationed? _____

A. Please answer questions 1-5 based on your personal experiences. (Y/N)

- _____ 1. Have you ever worked in a medical team where you did not feel comfortable voicing your professional opinion?
- _____ 2. Have you ever worked in a medical team where there was no clearly designated leader?
- _____ 3. Have you ever felt pressured to perform a medical procedure that you felt uncomfortable doing?
- _____ 4. Have you ever witnessed an actual or potential mishap that could have been prevented if the team had learned from their previous mistakes?
- _____ 5. Have you ever witnessed a routine medical procedure that went wrong because the team did not adequately prepare beforehand?

B. Please rate questions 6-15 using the following 5-point scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

- _____ 6. The culture in our department makes it easy to learn from the mistakes of others.
- _____ 7. Our doctors, nurses, enlisted personnel, and other team members work together as a well-coordinated team.
- _____ 8. Disruptions in patient care (e.g., shift changes, patient transfers) can be detrimental to patient safety.
- _____ 9. Physicians, nurses, enlisted personnel, and other team members in this department know and understand each others' respective responsibilities.
- _____ 10. My department does a good job of training new personnel.
- _____ 11. Teamwork deserves more attention in health care.
- _____ 12. I am confident about my ability to work effectively in a team.
- _____ 13. Teamwork is one of the most important skills in the OR.
- _____ 14. People with strong teamwork skills are more likely to be successful in health care.
- _____ 15. It is impossible to function in health care without being a good team player.

Medical Team Training Survey (DOM)

The purpose of this survey is to improve the effectiveness of DoD-sponsored medical team training (MTT) programs. The survey should take approximately 10 minutes of your time. Your name is not required. We appreciate your feedback!

Physician _____ Nurse _____ Other (please specify) _____

What is your medical specialty? _____

A. Please answer questions 1-5 based on your personal experiences. (Y/N)

- _____ 1. Have you ever worked in a medical team where you did not feel comfortable voicing your professional opinion?
- _____ 2. Have you ever worked in a medical team where there was no clearly designated leader?
- _____ 3. Have you ever felt pressured to perform a medical procedure that you felt uncomfortable doing?
- _____ 4. Have you ever witnessed an actual or potential mishap that could have been prevented if the team had

_____ learned from their previous mistakes?

_____ 5. Have you ever witnessed a routine medical procedure that went wrong because the team did not adequately prepare beforehand?

B. Please rate questions 6-15 using the following 5-point scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

_____ 6. The culture in our department makes it easy to learn from the mistakes of others.

_____ 7. Our doctors, nurses, enlisted personnel, and other team members work together as a well-coordinated team.

_____ 8. Disruptions in patient care (e.g., shift changes, patient transfers) can be detrimental to patient safety.

_____ 9. Physicians, nurses, enlisted personnel, and other team members in this department know and understand each others' respective responsibilities.

_____ 10. My department does a good job of training new personnel.

_____ 11. Teamwork deserves more attention in health care.

_____ 12. I am confident about my ability to work effectively in a team.

_____ 13. Teamwork is one of the most important skills in the OR.

_____ 14. People with strong teamwork skills are more likely to be successful in health care.

_____ 15. It is impossible to function in health care without being a good team player.

Appendix B. Post-training Questionnaires

Medical Team Training Survey (MEDTEAMS™)

The purpose of this survey is to improve the effectiveness of DoD-sponsored medical team training (MTT) programs. The survey should take approximately 10 minutes of your time. Your name is not required. We appreciate your feedback!

Date _____ Time _____

Physician _____ Nurse _____ Corpsman _____ Other (please specify) _____

A. Please rate questions 1- 9 using the following 5-point scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

- _____ 1. The training was well-organized.
- _____ 2. The training content (case studies, videos, demonstrations, etc.) was appropriate for my department.
- _____ 3. Training prepared me to work effectively in my job.
- _____ 4. Training was an effective use of my time.
- _____ 5. Training will help my department improve patient safety.
- _____ 6. I am confident that I can perform the tasks that were trained.
- _____ 7. I am confident that I understood the training content.
- _____ 8. I am confident that I can use the knowledge that I learned on the job.
- _____ 9. As a result of this training, I feel more confident about my ability to work effectively in a team.

B. In the space provided, please provide your comments for questions 10 - 12.

10. Did this training meet your expectations? Why or why not?
11. If you were to re-design this training: What would you add? What would you remove? What would stay the same? Why?
12. Would you recommend this training to others at work? Why or why not?

Medical Team Training Survey (MTM)

The purpose of this survey is to improve the effectiveness of DoD-sponsored medical team training (MTT) programs. The survey should take approximately 10 minutes of your time. Your name is not required. We appreciate your feedback!

Physician ____ Nurse ____ Other (please specify) _____

What is your medical specialty? _____ At what base are you stationed? _____

If we have additional questions at a later time, may we contact you? YES NO

Name _____

E-mail address: _____ Phone number: _____

A. Please rate questions 1- 9 using the following 5-point scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

- ____ 1. The training was well-organized.
- ____ 2. The training content (case studies, videos, demonstrations, etc.) was appropriate for my department.
- ____ 3. Training prepared me to work effectively in my job.
- ____ 4. Training was an effective use of my time.
- ____ 5. Training will help my department improve patient safety.
- ____ 6. I am confident that I can perform the tasks that were trained.
- ____ 7. I am confident that I understood the training content.
- ____ 8. I am confident that I can use the knowledge that I learned on the job.
- ____ 9. As a result of this training, I feel more confident about my ability to work effectively in a team.

B. In the space provided, please provide your comments for questions 10 - 12.

10. Did this training meet your expectations? Why or why not?
11. If you were to re-design this training: What would you add? What would you remove? What would stay the same? Why?
12. Would you recommend this training to others at work? Why or why not?

Medical Team Training Survey (DOM)

The purpose of this survey is to improve the effectiveness of DoD-sponsored medical team training (MTT) programs. The survey should take approximately 10 minutes of your time. Your name is not required. We appreciate your feedback!

Physician ____ Nurse ____ Other (please specify) _____

What is your medical specialty? _____

If we have additional questions at a later time, may we contact you? YES NO

Name _____

E-mail address: _____ Phone number: _____

A. Please rate questions 1- 9 using the following 5-point scale.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

- ____ 1. The training was well-organized.

- _____
- _____ 2. The training content (case studies, videos, demonstrations, etc.) was appropriate for my department.
- _____ 3. Training prepared me to work effectively in my job.
- _____ 4. Training was an effective use of my time.
- _____ 5. Training will help my department improve patient safety.
- _____ 6. I am confident that I can perform the tasks that were trained.
- _____ 7. I am confident that I understood the training content.
- _____ 8. I am confident that I can use the knowledge that I learned on the job.
- _____ 9. As a result of this training, I feel more confident about my ability to work effectively in a team.

B. In the space provided, please provide your comments for questions 10 - 12.

10. Did this training meet your expectations? Why or why not?
11. If you were to re-design this training: What would you add? What would you remove? What would stay the same? Why?
12. Would you recommend this training to others at work? Why or why not?

Appendix C. Data Collection Protocol for Instructors

Data Collection Protocol MedTeams™ Instructors

Introduction

“Hello, my name is _____. I’m with American Institutes for Research, a non-profit research organization. We are working on a project to evaluate the best practices in medical team training (MTT) programs through the Agency for Healthcare Research and Quality (AHRQ) and the Department of Defense (DoD). [Heidi or Renee] recommended that we interview you to learn more about MedTeams™.”

“The purpose of this interview is to gather additional information about the Emergency Team Coordination Course®. The interview should take approximately 30 minutes. Your name will not be linked to any of the responses in the final report.”

“Would you be interested in participating? Do you have any questions before we begin?”

“Okay. Let’s begin.”

Questions

1. A. How much time did you spend preparing to teach the course?
- B. How/why were you selected to be an instructor for this course? Have you taught this training course before? Have you ever taught any training course before?
- C. What kind of training and preparation must instructors go through, other than the “train-the-trainer” course? Do you feel adequately prepared to be an instructor in this course?
- D. Do you think the flow and sequencing of the course makes sense? Does it make sense to the trainees?
- E. Do you think the training aids for the course are useful? (e.g. viewgraphs, videos, etc.) Are there other training aids that you think would be useful to have?

- A. List the three best features of the training program in your opinion. What is it about these features that you like?
 - B. List three features of the program that could use improvement. Why do these features need improvement? Do you have suggestions for how they could be improved?
- A. Which parts should be more of a focus in the course? Why?
 - B. Which parts should be less of a focus in the course? Why?
- Is there anything about this training program that we haven't covered that we should know? If so, what?
- How likely do you think it is that this training will be effective in your department?

6. That's all the questions I have. Should we have additional questions at a later time, would you be willing to provide an e-mail address and phone number where we could get a hold of you?

Name: _____

E-mail address: _____

Phone number: _____

7. Do you have any final comments?

Thank you! Your comments have been very helpful.

MTM DATA COLLECTION PROTOCOL

Instructors

The American Institutes for Research, a not-for-profit research organization, is working on a project to evaluate the best practices in medical team training (MTT) programs through the Agency for Healthcare Research and Quality (AHRQ) and the Department of Defense (DoD).

The purpose of this survey is to gather additional information about the Medical Team Management course. Your name will not be linked to any of the responses in the final report.

Physician _____ Nurse _____ Other (please specify) _____

What is your medical specialty? _____

At what base are you stationed?_____

1.
 - A. How/why were you selected to attend the “train-the-trainer” course and become an instructor for this course? Have you ever taught any training courses before?
 - B. What kind of training and preparation must instructors go through, other than the “train-the-trainer” course, in order to teach the course? Do you feel adequately prepared to be an instructor for this course? Do you feel prepared to answer questions from your students?
 - C. Do you think the flow and sequencing of the course makes sense? Do you think it will make sense to the trainees?
 - D. Do you think the training aids for the course are useful? (e.g., videos, etc.) What other training aids do you think would be useful?
2.
 - A. What do you feel are the major obstacles to implementing the training, if any? Why? What can be done to overcome them?
 - B. How do you think people at your military training facility (MTF) will react to this training? (e.g. positively, skeptically, etc.)

3. A. List the three best features of the training program. What is it about these features that you like?
- B. List three features of the program that could use improvement. Why do these features need improvement? How could they be improved?
4. When do you anticipate that the training will be implemented at your MTF?
5. Do you have any final comments?
6. If we have additional questions at a later point in time, may we contact you?
YES NO
- Name _____
- E-mail address _____
- Phone number _____

Thank you! Your comments have been very helpful.

Appendix D. Expert Panel Participants

Program Evaluation of Medical Team Training

January 27, 2003

AIR Staff

David Baker, Ph.D.
Principal Research Scientist
American Institutes for Research
1000 Thomas Jefferson Street
Washington DC, 20007
202-342-5036 (phone)
202-342-5033 (fax)
dbaker@air.org

Jeff Beaubien, Ph.D.
Research Scientist
American Institutes for Research
1000 Thomas Jefferson Street
Washington DC, 20007
202-342-5133 (phone)
202-342-5033 (fax)
jbeaubien@air.org

Amy Harvey, M.A.
Research Associate
American Institutes for Research
1000 Thomas Jefferson Street
Washington DC, 20007
202-298-2643 (phone)
202-342-5033 (fax)
aharvey@air.org

DoD Representatives

Heidi King, M.S.
Program Manager, DoD Patient Safety Healthcare Team Coordination Program
Office of the Assistant Secretary of Defense/Health Affairs
TRICARE Management Activity
Office of the Chief Medical Officer
Skyline 5, Suite 810
5111 Leesburg Pike
Falls Church, VA 22041
703-681-0064 Ext. 3611 (phone)
heidi.king@tma.osd.mil

Lt. Col. Beth Y. Kohsin
United States Air Force
Office of the Surgeon General
1335 East West Highway, Suite 6-100
Silver Spring, MD 20910
202-767-4270 (phone)
beth.kohsin@pentagon.af.mil

CAPT. Glen Merchant, MD, M.P.H., T.M.
Director
DoD Center for Education and Research in Patient Safety
Room A1044
4301 Jones Bridge Road
Bethesda, MD 20814-4799
301-295-9297 (phone)
301-295-9298 (fax)
gmerchant@cox.net

CAPT. Frances Stewart, MD, MC, USN
Clinical and Program Policy
Office of the Assistant Secretary of Defense (Health Affairs)
703-681-1703 (phone)
703-681-3658 (fax)
frances.stewart@ha.osd.mil

AHRQ Representatives

James Battles, Ph.D.
Center for Quality Measurement & Improvement
AHRQ
2101 East Jefferson Street, Suite 502^{†††}
Rockville, MD 20852
301-594-9892 (phone)
JBattles@ahrq.gov

Kerm Henriksen, Ph.D.
Department of Health and Human Services - AHRQ
6011 Executive Blvd, Rm 200^{†††}

^{†††} Current address:
AHRQ
540 Gaither Road
Rockville, MD 20850

^{†††} Current address:
AHRQ
540 Gaither Road
Rockville, MD 20850

Rockville, MD 20852
301-594-6858 (phone)
310-594-2155 (fax)
khenriks@ahrq.gov

Expert Panel Members

David C. Aron, MD, MS
Professor of Medicine and Epidemiology and Biostatistics
Case Western Reserve University School of Medicine
Director, Center for Quality Improvement Research
Education Office 14(W)
Louis Stokes Cleveland DVA Medical Center
10701 East Blvd.
Cleveland, OH 44106
216-421-3098 (phone)
216-231-3427 (fax)
David.Aron@med.va.gov

Paul Barach, MD
University of Chicago
Department of Anesthesia and Critical Care
5841 South Maryland Avenue, MC 4028
Chicago, IL 60637
773-834-0689 (phone)
PBarach@dacc.uchicago.edu

Clint A. Bowers, Ph.D.
Department of Psychology
University of Central Florida
PO Box 161390
Orlando, FL 32816-1390
407-823-5607 (phone)
bowers@mail.ucf.edu

Jeffrey B. Cooper, Ph.D.
Associate Professor of Anesthesia
Massachusetts General Hospital
Dept of Anesthesia
32 Fruit Street
Boston, MA 02114
617-726-1636 (phone)
617-726-6973 (fax)
jcooper@partners.org

Eleana Edens, Ph.D.
Federal Aviation Administration

Office of the Chief Scientific Advisor for Human Factors (AAR-100)
45005 Aviation Drive, Suite 203A
Dulles, VA 20166-7560
703-661-0262 (phone)
eleanae@aol.com

Amy Edmondson, Ph.D.
Associate Professor
Harvard Business School
Soldiers Field
Cambridge, MA 02138
617-495-6732 (phone)
aedmondson@hbs.edu

David M. Gaba, MD
VA Palo Alto Health Care System
Patient Safety Center of Inquiry
Anesthesia Service, 112A
3801 Miranda Avenue
Palo Alto, CA 94304
650-858-3938 (phone)
650-849-0421 (fax)
gaba@stanford.edu

Capt. William R. Hamman, MD, Ph.D.
United Airlines Training Center
7401 Martin Luther King Blvd.
Denver, CO 80207
770-683-1679 (phone)
rossha@aol.com

Robert L. Helmreich, Ph.D.
Professor of Psychology
Project Director
The University of Texas Human Factors Research Project
Room 4.110, The Seay Building
Mail Code A8000
108 East Dean Keeton St.
Austin, TX 78713
512-475-7913 (phone)
512-475-7935 (fax)
helmreich@mail.utexas.edu

Margarita P. Hurtado, Ph.D.
Principal Research Scientist
American Institutes for Research
1000 Thomas Jefferson St.

Washington, DC 20007-3835
202-342-5056 (phone)
mhurtado@air.org

Gregory D. Jay, MD, Ph.D., F.A.C.E.P
Assistant Professor of Emergency Medicine
Brown University
Box G-RIH
Providence, RI 02912
Director of Emergency Medicine Residency Research
Rhode Island Hospital Emergency Department
401-444-6237 (phone)
Gregory_Jay_MD@Brown.ED

Florian Jentsch, Ph.D.
Team Performance Laboratory/Partnership For Aviation Team Training Research
University of Central Florida
Department of Psychology - HP 309
University of Central Florida
4000 Central Florida Boulevard
Orlando, FL 32816-1390
407-384-2888 (phone)
407-384-2899 (fax)
fjentsch@pegasus.cc.ucf.edu

Ann S. Kenny, M.P.H.
Principal Project Specialist
American Institutes for Research
1000 Thomas Jefferson St.
Washington, DC 20007-3835
202-342-5082 (phone)
akenny@air.org

Michael M. Leonard, MD
Kaiser Permanente
Physician Leader, Patient Safety (Colorado Region and Nationally)
10350 East Dakota Ave.
Denver, CO 80231-1314
303-344-7200 (phone)
mmleonard@worldnet.att.net

John Norcini, Ph.D.
Institute for Clinical Evaluation
510 Walnut Street, Suite 1410
Philadelphia, PA 19106
215-446-3540 (phone)
jnorcini@icemed.org

Eduardo Salas, Ph.D.
Department of Psychology
University of Central Florida
PO Box 161390
Orlando, FL 32816-1390
407-823-2552 (phone)
esalas@pegasus.cc.ucf.edu

David B. Swanson, Ph.D.
Deputy Vice President for Test Development
National Board of Medical Examiners
3750 Market Street
Philadelphia, PA 19104
215-590-9570 (phone)
215-590-9442 (fax)
dswanson@mail.nbme.org

Invited guests

Spencer Byrum
Crew Training International
9198 Crestwyn Hills Drive
Memphis, TN 38125
901-754-8839 (phone)
Toll free: 800 752-8839
Sbyrum@cti-crm.com

Mary Salisbury, RN
Crew Performance Group
Dynamics Research Corporation
60 Frontage Road
Andover, MA 01810-5498
978-475-9090 (phone)
978-475-8205 (fax)
MSalisbury@drc.com